Orbit Lesion Locator

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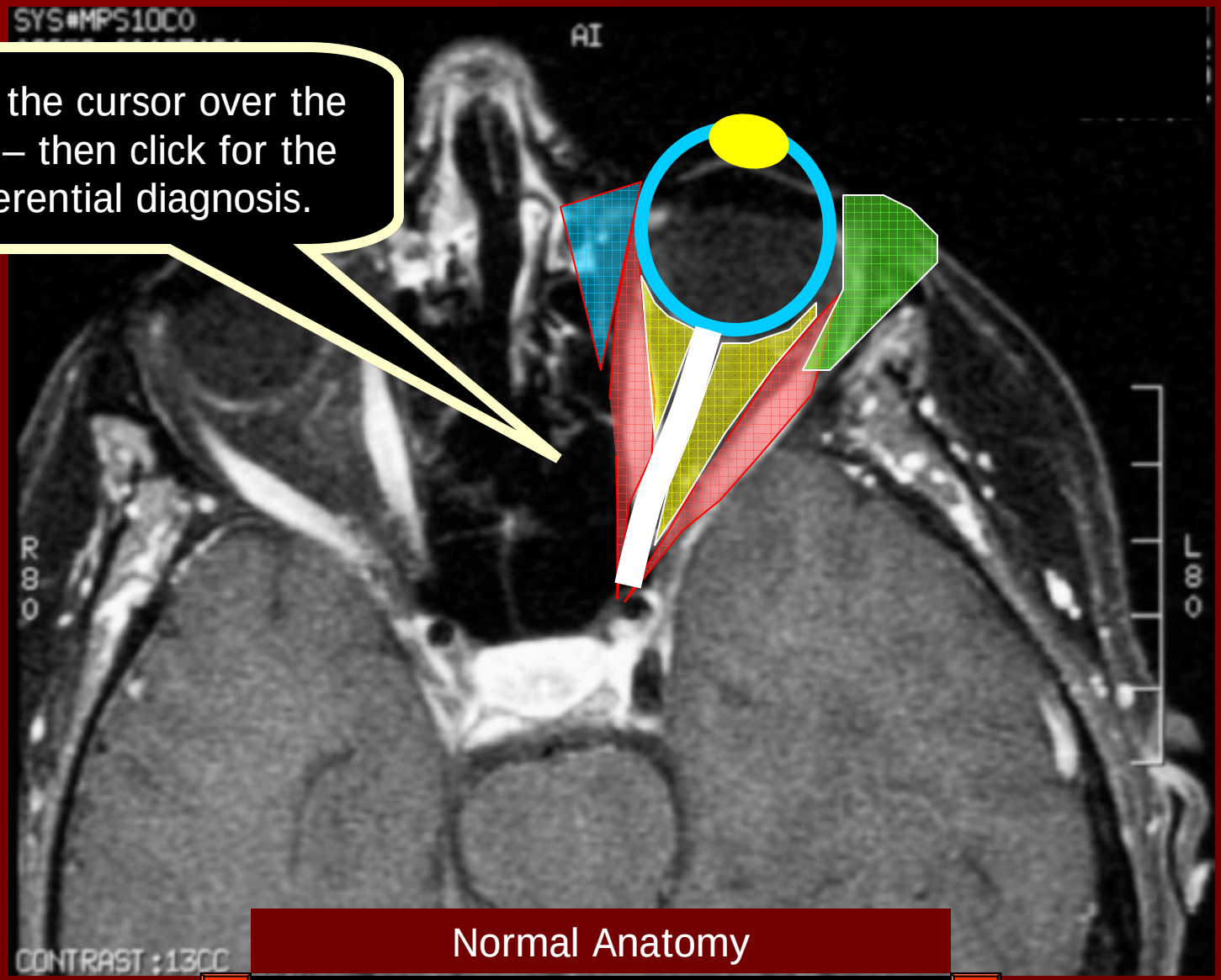
Orbit Lesion Navigator

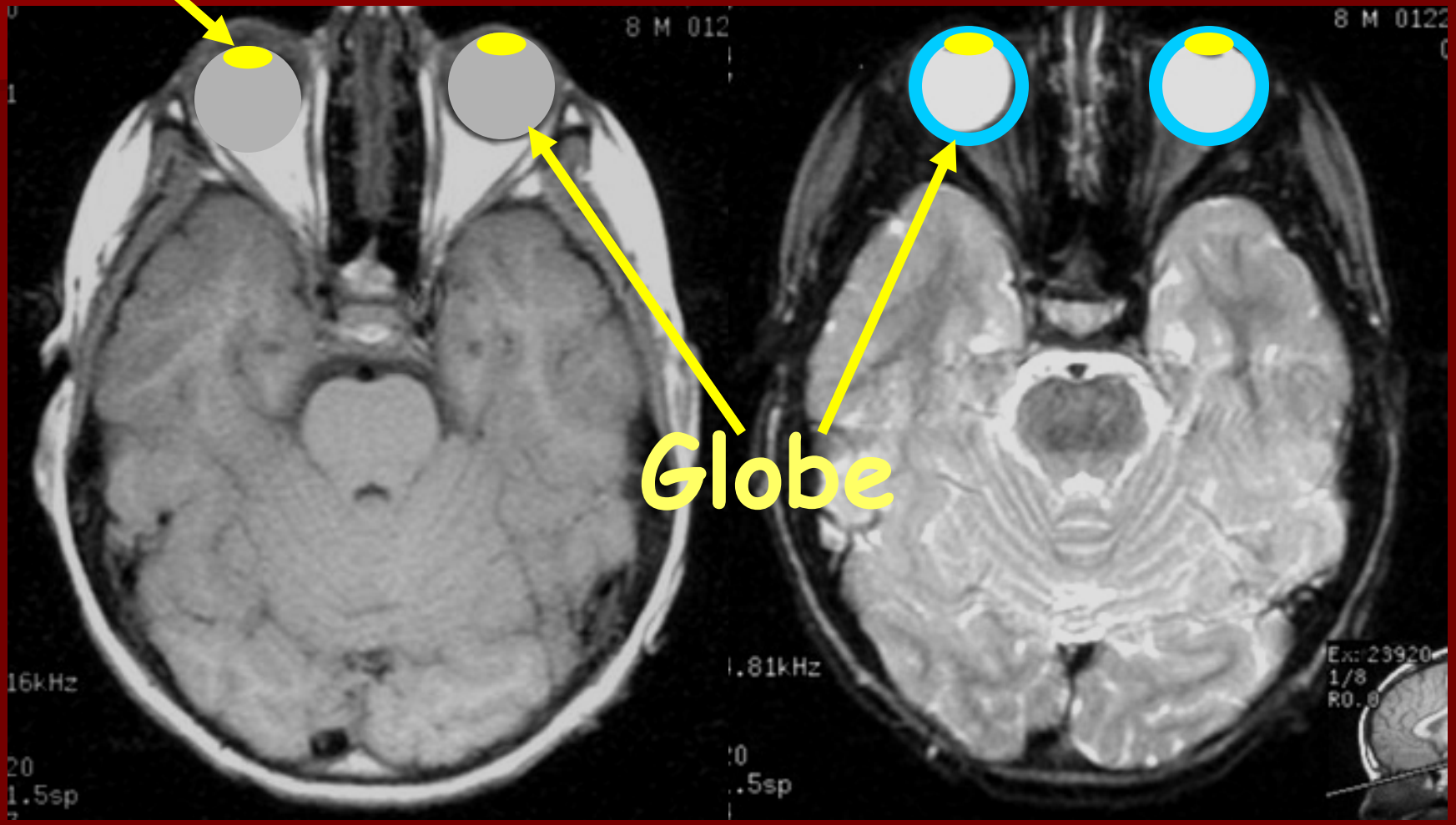


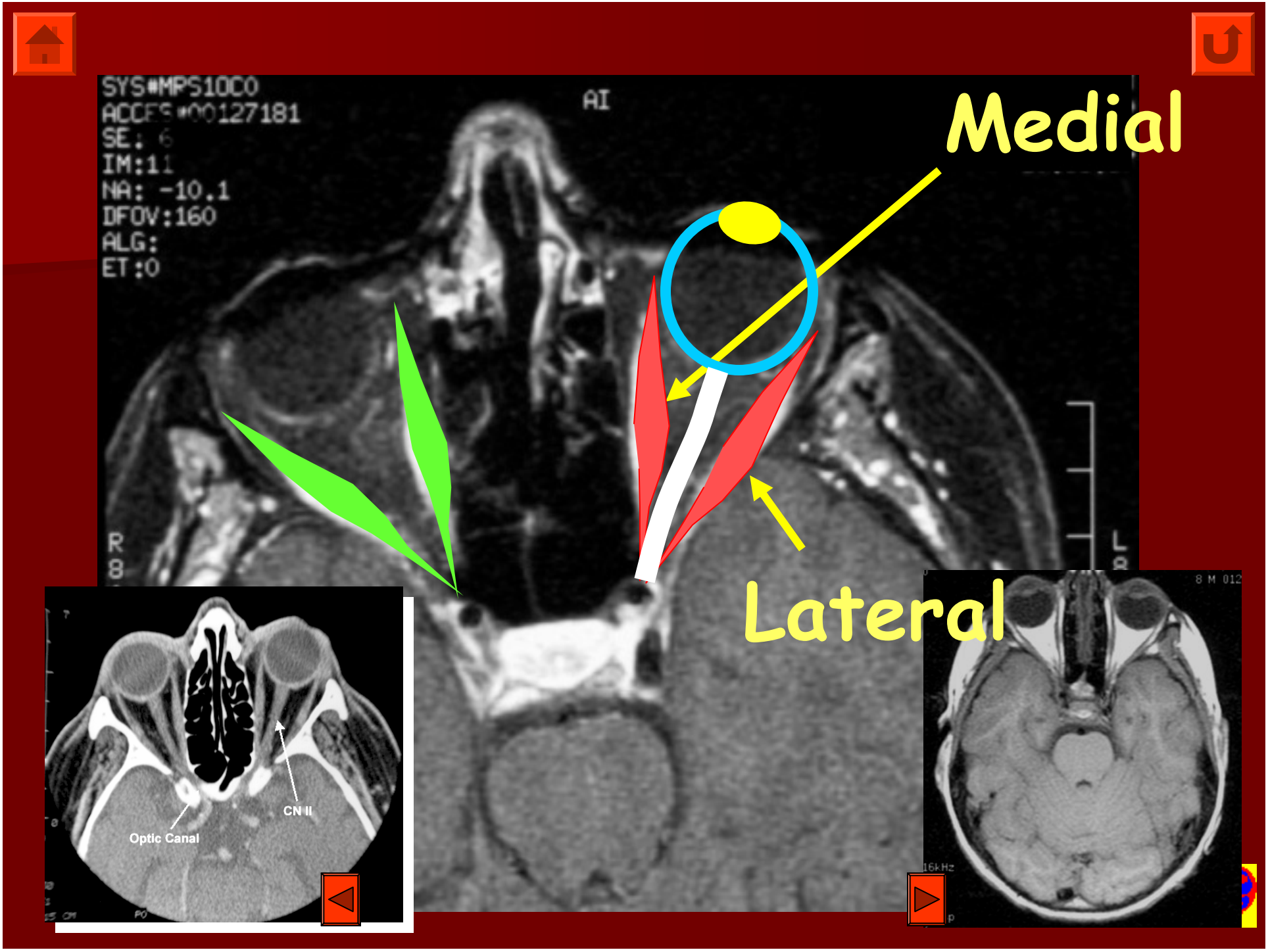
Move the cursor over the orbit – then click for the differential diagnosis.

Normal Anatomy

Author Credits

Normal Orbit

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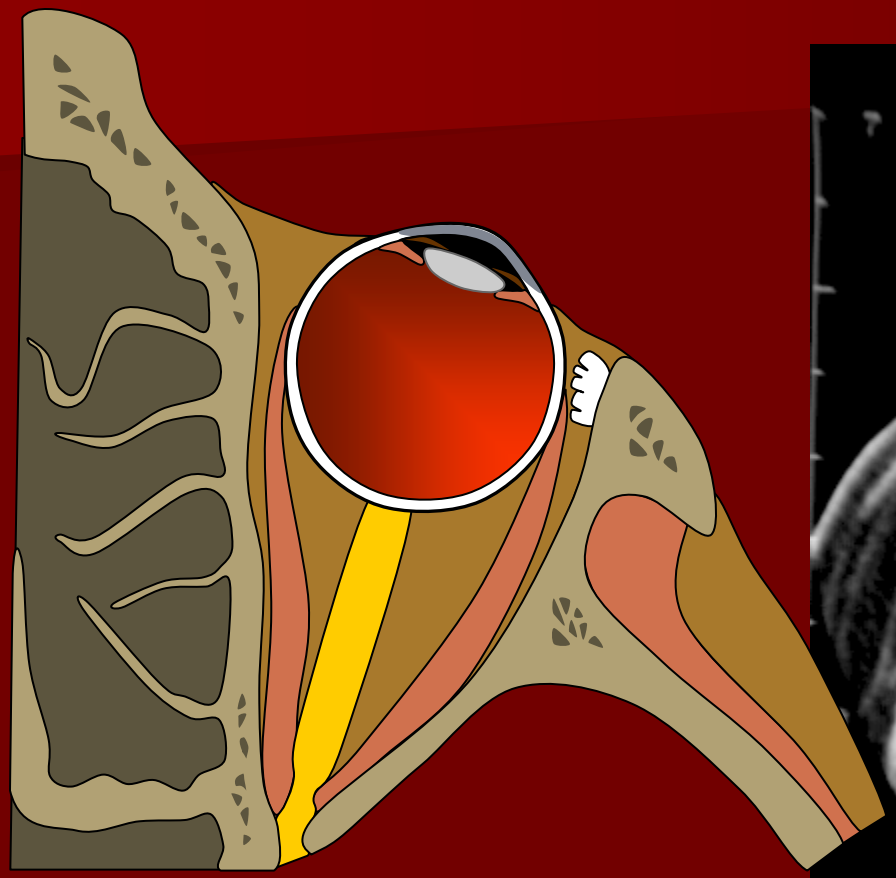
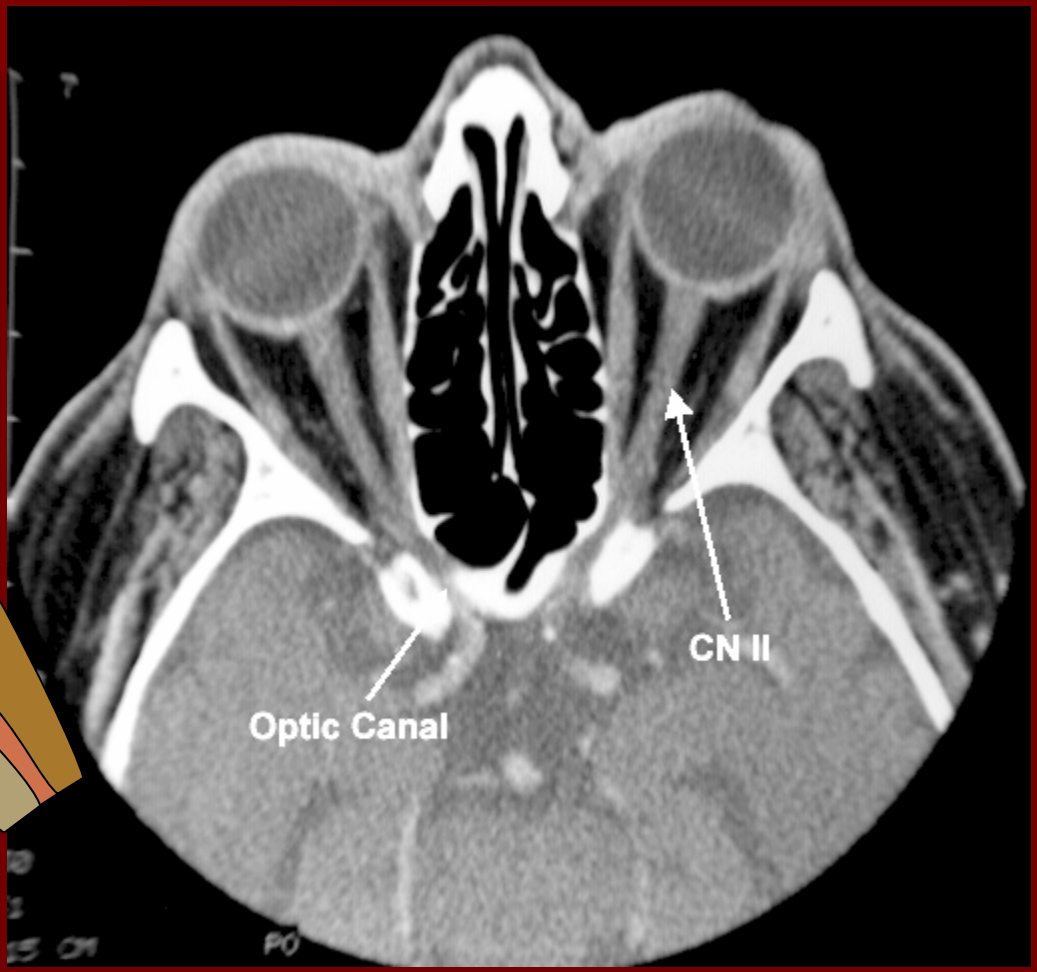
Medial
Lateral
Optic Canal
CN II

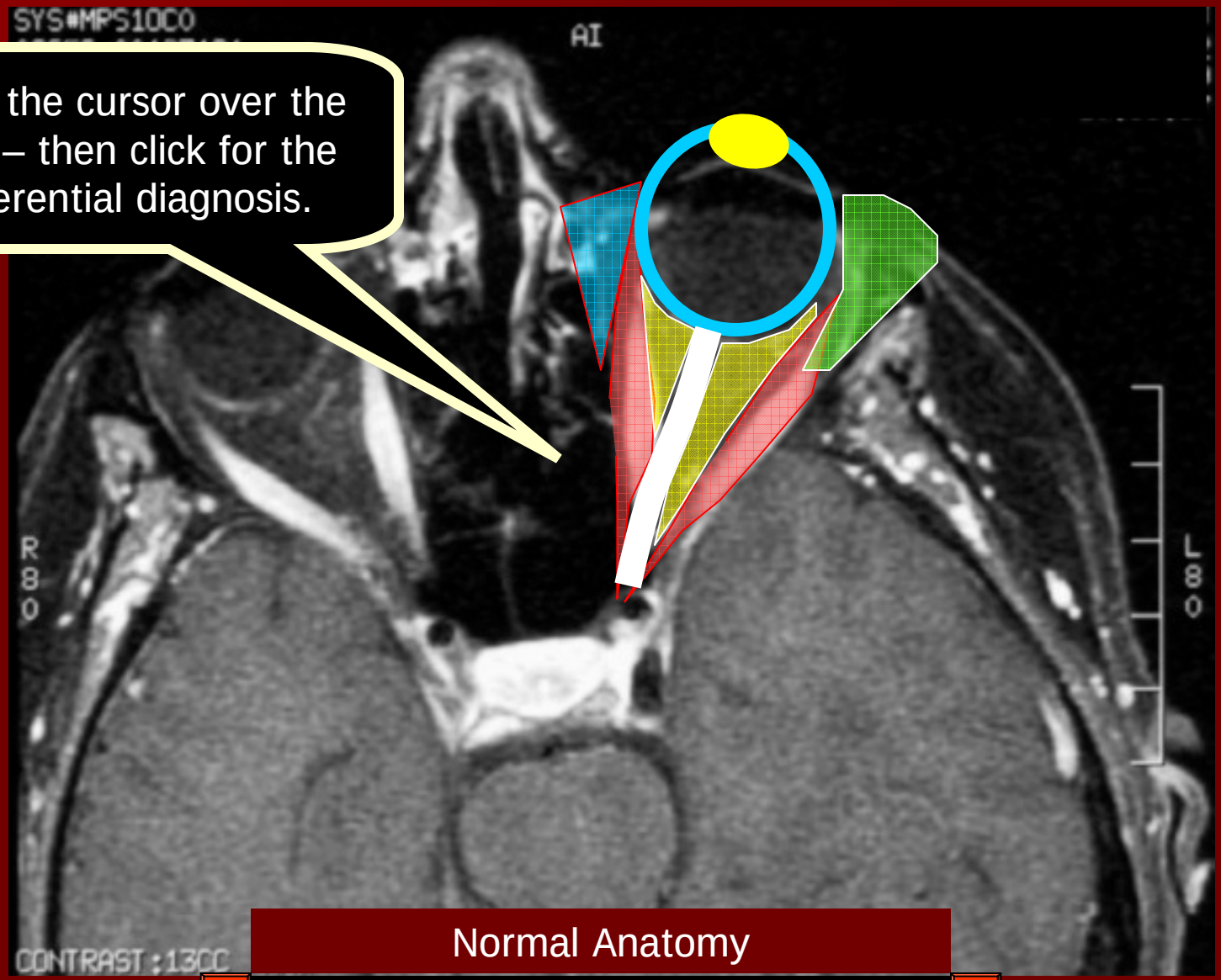


Axial section schematic



Orbit Anatomy

Orbit Lesion Navigator



Move the cursor over the orbit – then click for the differential diagnosis.

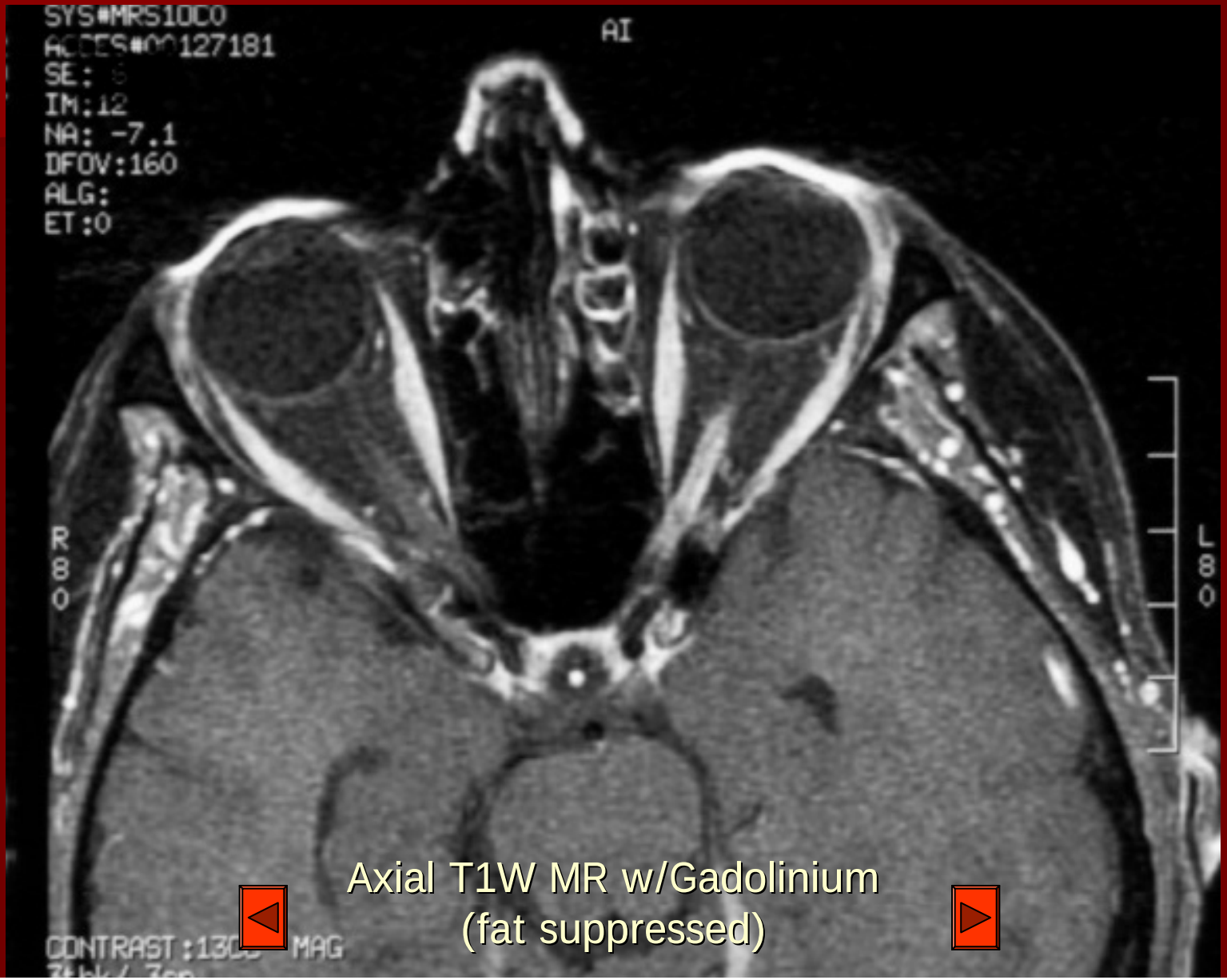
Normal Anatomy

Author Credits

Intraconal – Optic Nerve Lesions

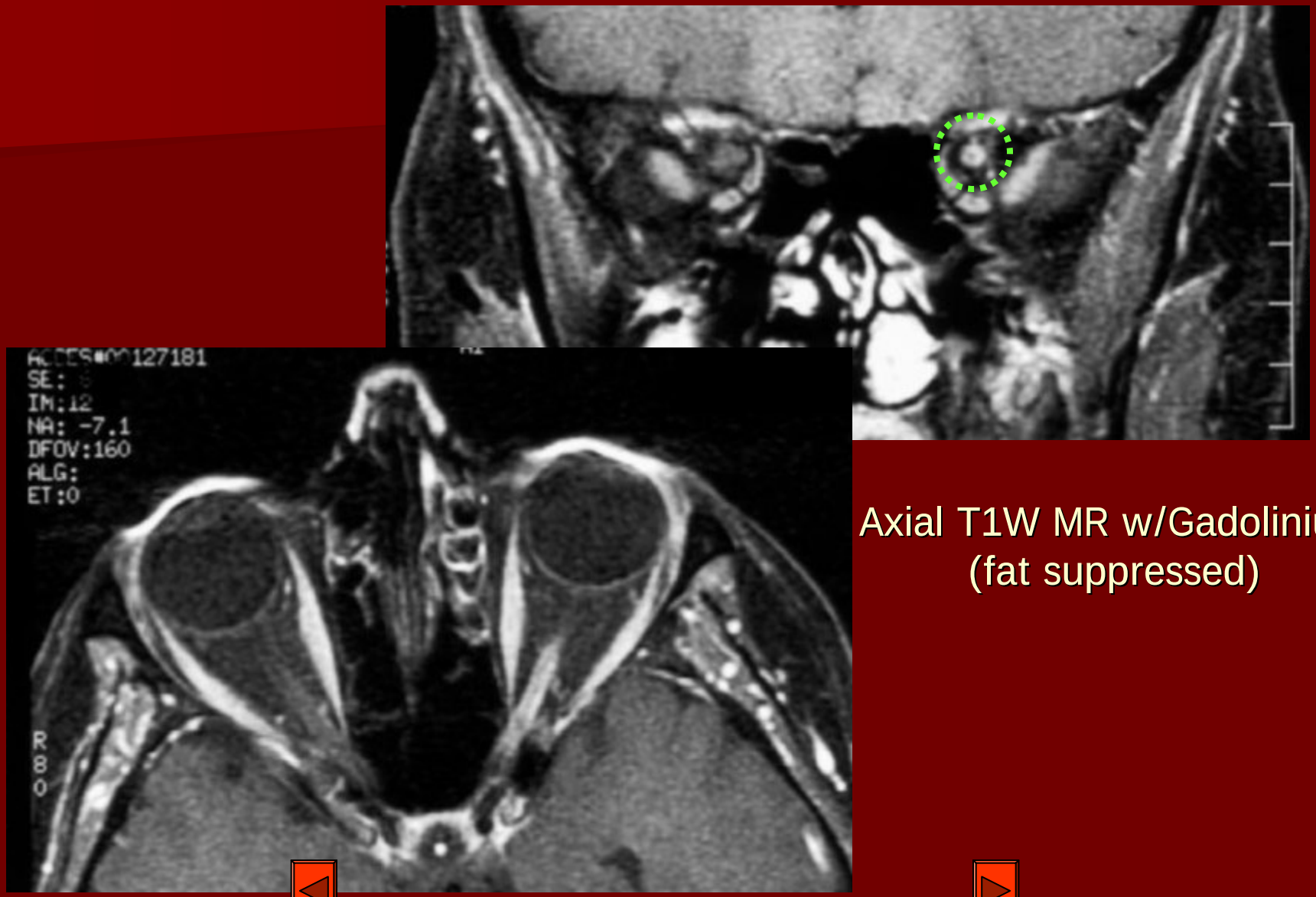
- Optic Neuritis
- Optic Nerve Glioma
- Optic Nerve Meningioma
- Dilated Optic Nerve Sheath

Optic Neuritis



Axial T1W MR w/Gadolinium
(fat suppressed)

Optic Neuritis

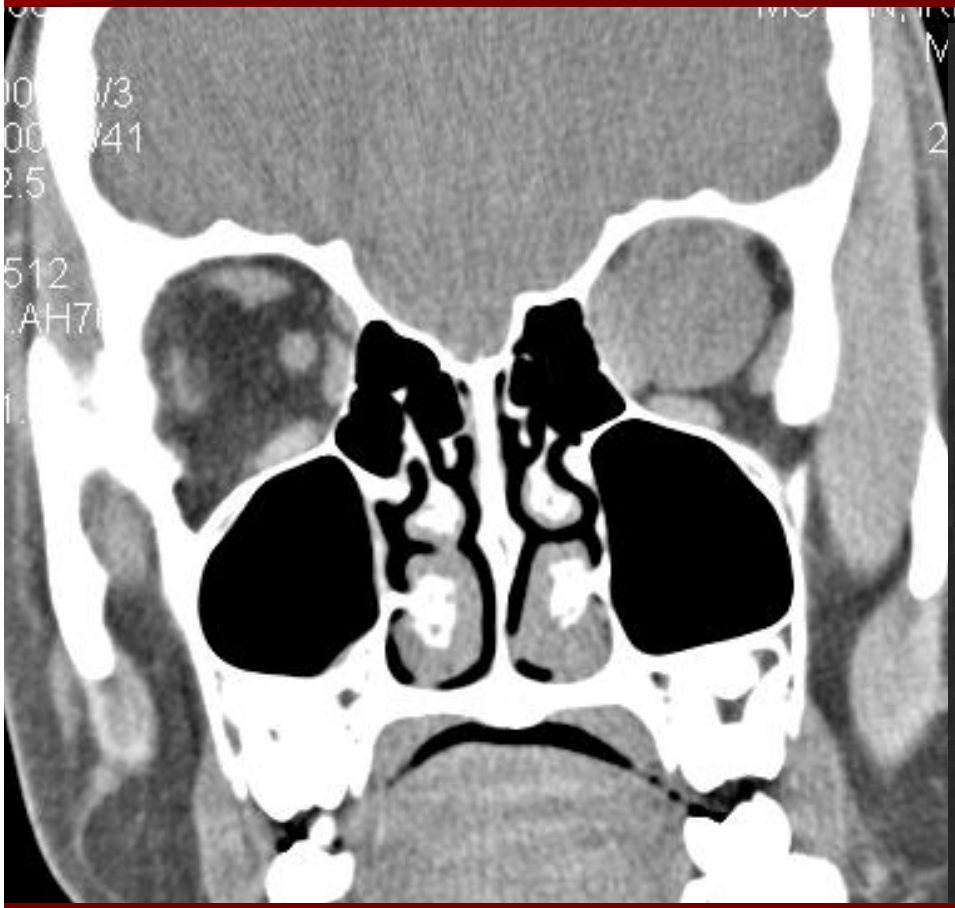


Axial T1W MR w/Gadolinium
(fat suppressed)

Optic Neuritis

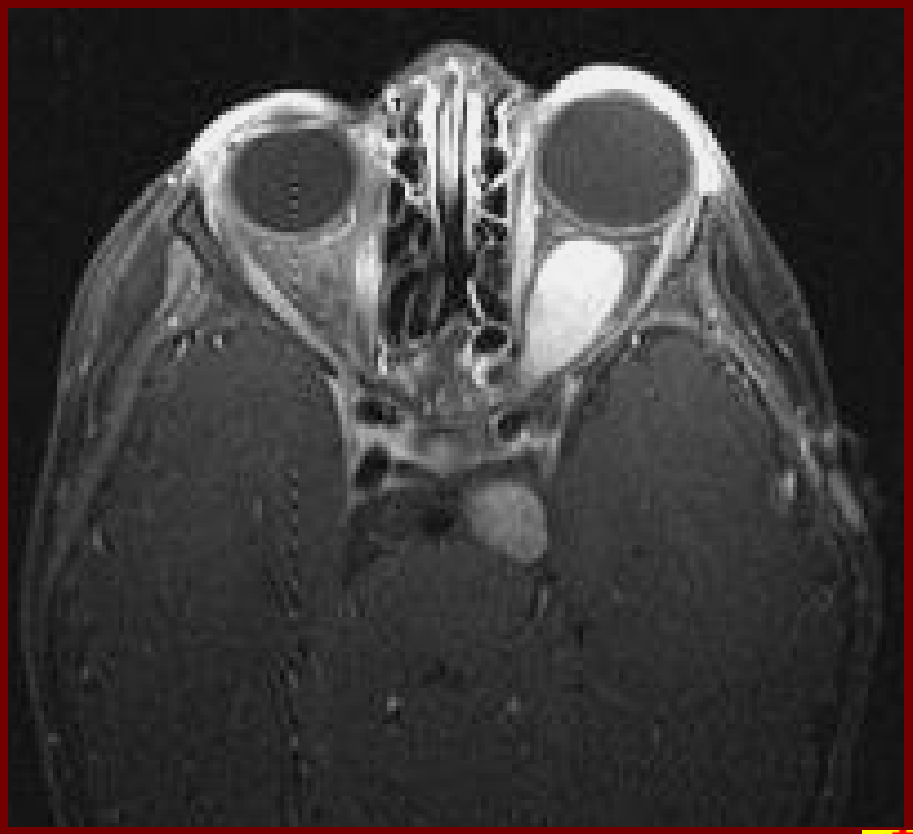
- Who: Adults < 45yo, women >> men
- Why: Multiple sclerosis, ocular infection, degeneration, ischemia, meningitis
- Symptoms: onset of unilateral vision loss over hours to days, with painful eye movements
- CT: Normal to mildly enlarged optic nerve and chiasm, may enhance
- MR: mild enlargement, enhancement of optic nerve
- Prognosis: spontaneous improvement, 1-2 weeks

Optic Nerve Glioma



Optic Nerve Glioma

Optic Nerve Glioma

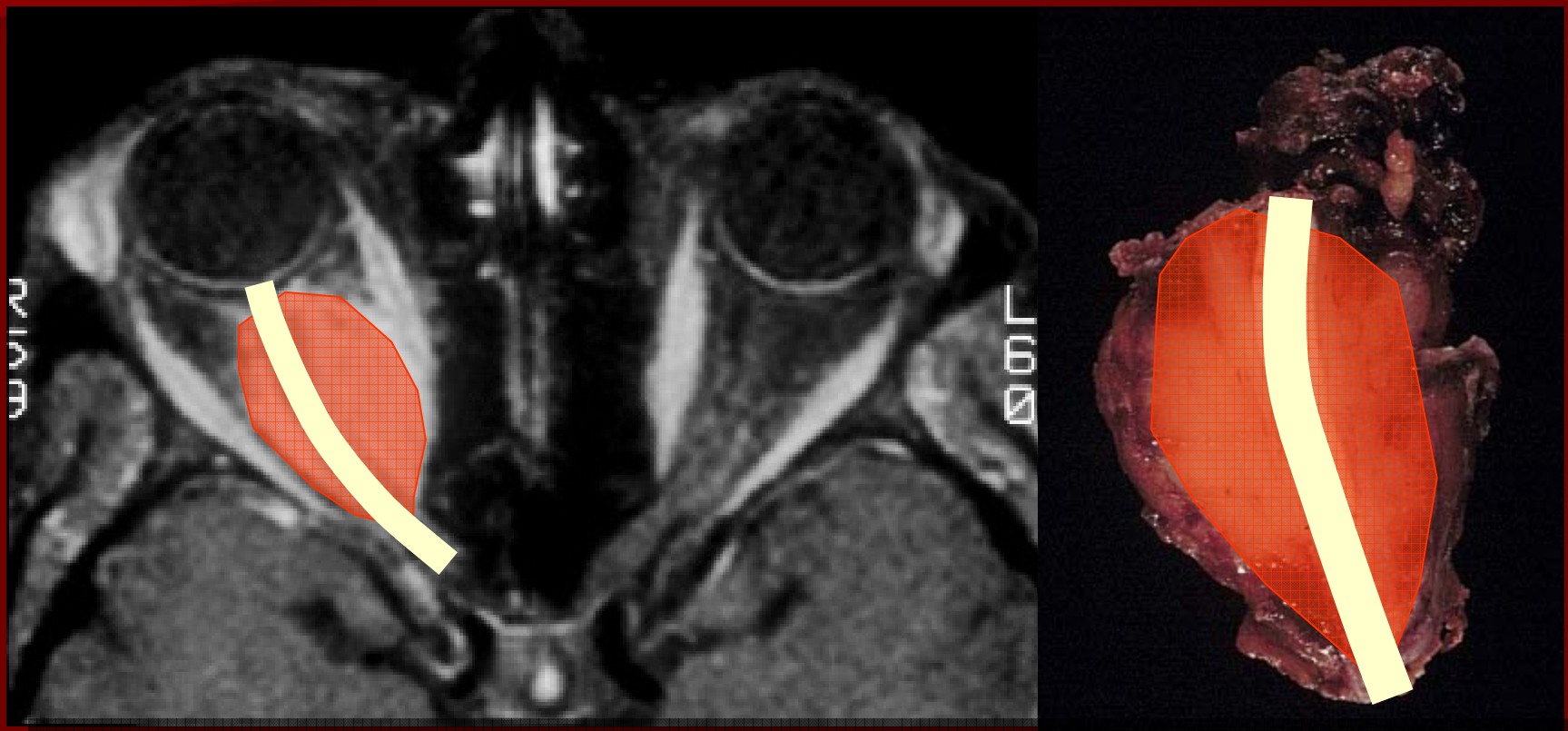


Optic Nerve Glioma

- Who: 80% < 10yo, M<F, peak 5 yo, extremely rare variant in 6th decade
- Why: Associated with NF in 10-50%
- Symptoms: Decreased visual acuity, minimal proptosis
- CT: fusiform enlargement of optic nerve, posterior extension along optic tracts in 2/3, slight enhancement, rarely calcification
- MR: T2 bright, slight enhancement, more sensitive for intracranial extent
- Prognosis: Pediatric – grows slowly, if at all

  Adult form – usually fatal

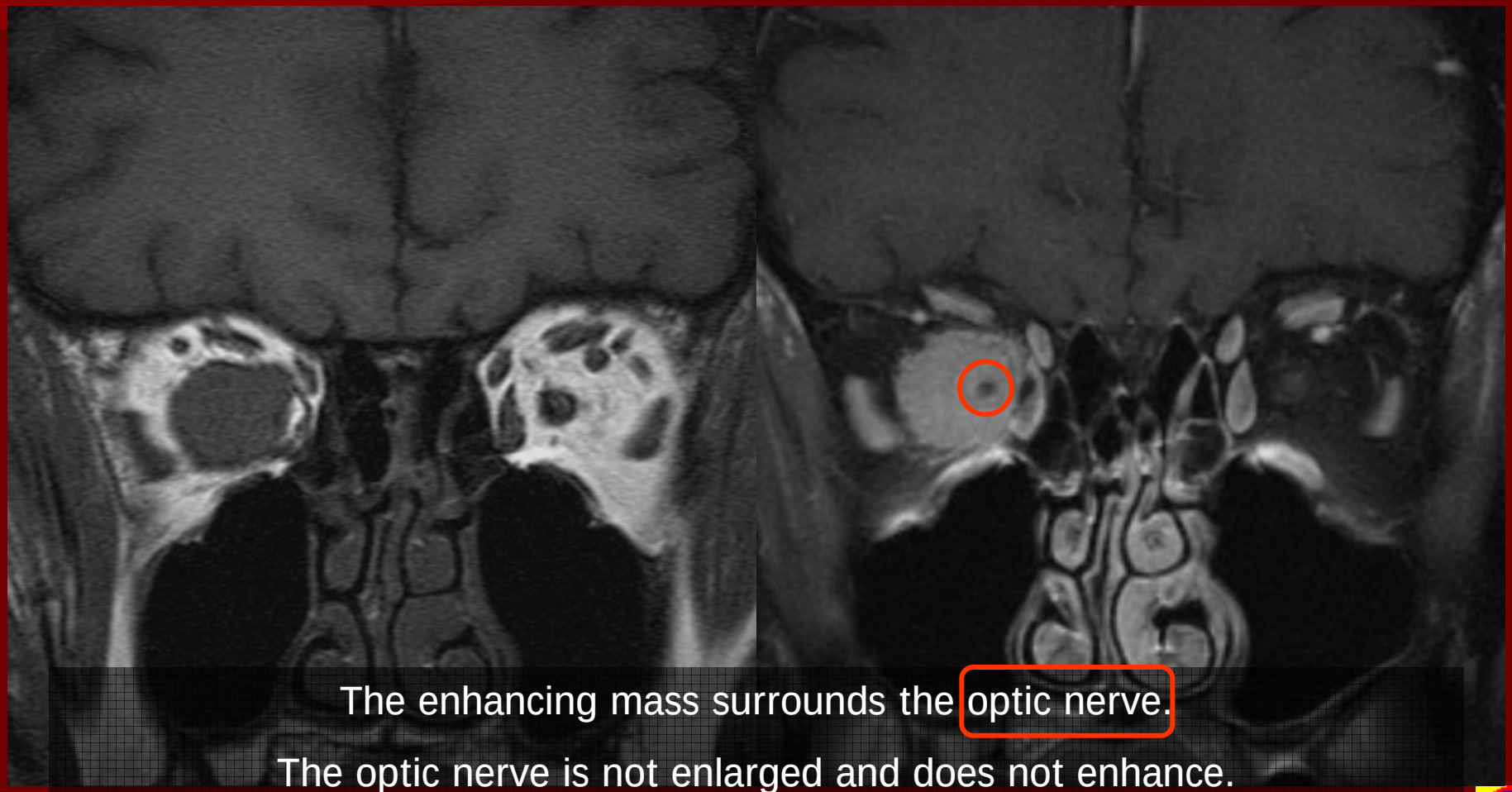
Optic Nerve Meningioma



The enhancing mass surrounds the optic nerve.

The optic nerve is not enlarged and does not enhance.

Optic Nerve Meningioma



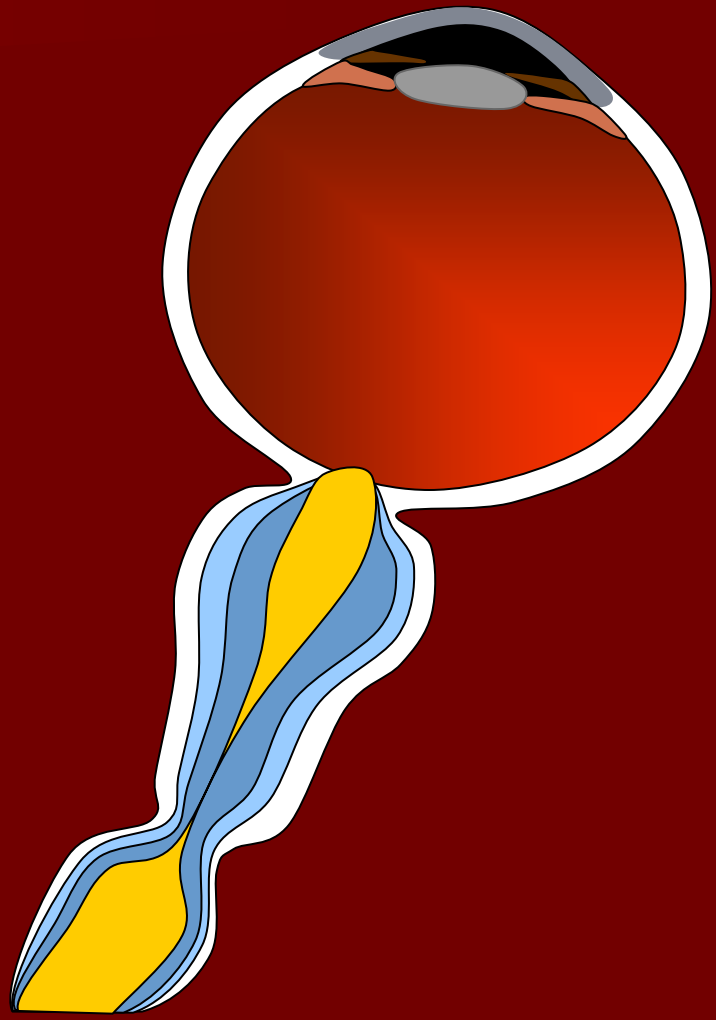
The enhancing mass surrounds the optic nerve.

The optic nerve is not enlarged and does not enhance.

Optic Nerve Meningioma

- Who: children, mid-age & elderly women,
  3:1 Women to men
- Why: arises from arachnoid rests in meningeal investiture of optic nerves, occasionally seen in NF
- Sx: loss of visual acuity over months, proptosis
- CT/MR: calcifications strongly suggestive, tubular thickening of nerve, with enhancing “tram tracks” on axial view/”ring” on coronal view around nonenhancing optic nerve
- Prognosis: In one series, 87% 5-year and 58% 10-year survival

Dilated Optic Nerve Sheaths (Pseudotumor cerebri in a child)

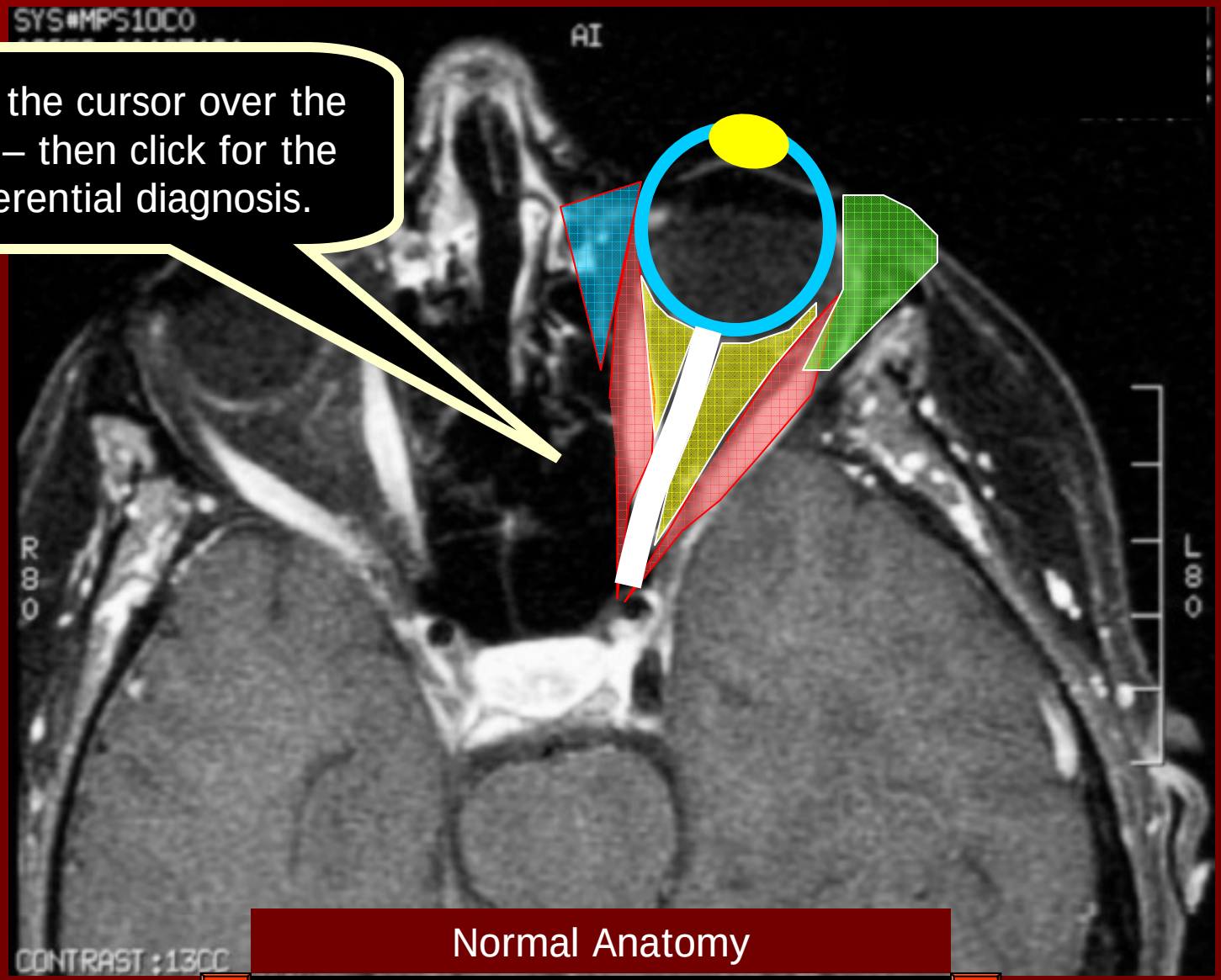


Courtesy Mauricio Castillo, M.D.

Dilated optic sheaths

- Dysplasia of dura
  - Marfan, Ehler-Danlos
- Arachnoid hypertrophy + dural dysplasia: NF-1
- Increased intracranial pressure
  - Lead, Vitamin A, venous thrombosis or narrowing (skull base dysplasias), pseudotumor (rare in children)
- Clinical mimicker: Drusen bodies

Orbit Lesion Navigator



Move the cursor over the orbit – then click for the differential diagnosis.

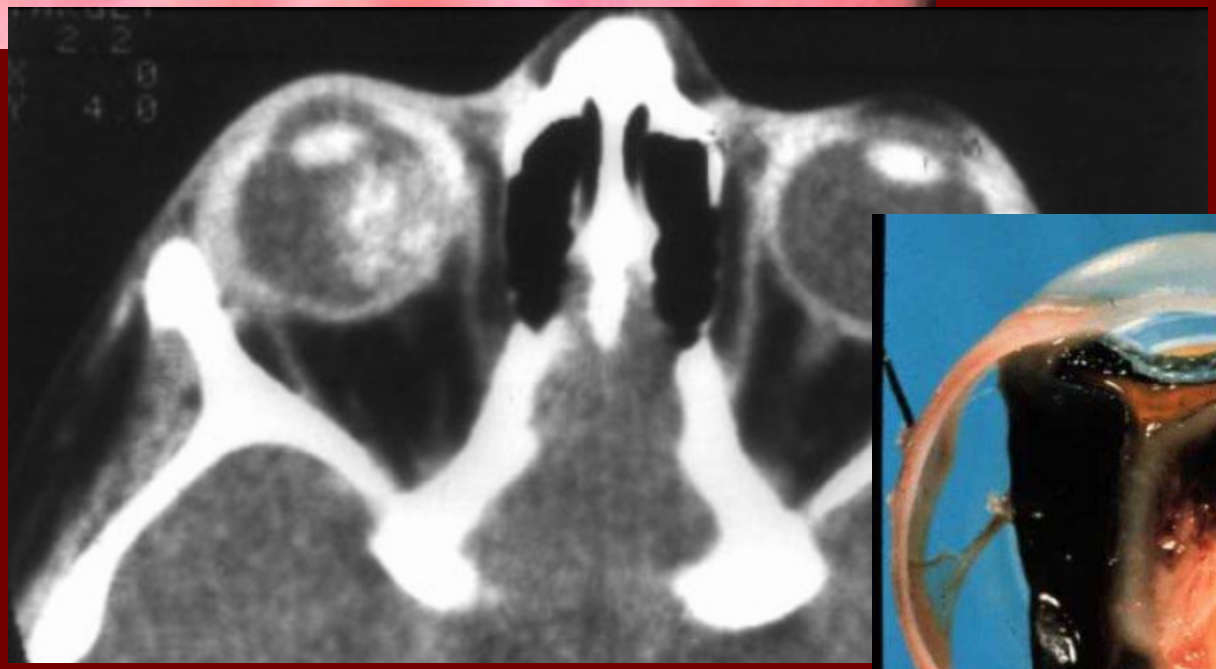
Normal Anatomy

Author Credits

Globe Lesions

- Neoplastic
  - Retinoblastoma
  - Melanoma
  - Metastasis
- Non-Neoplastic
  - Large Globe
    - Coloboma
    - Staphyloma
    - Sturge-Weber
    - Neurofibromatosis Type 1
  - Normal Globe
  - Small Globe
    - Persistent Hyperplastic Primary Vitreous

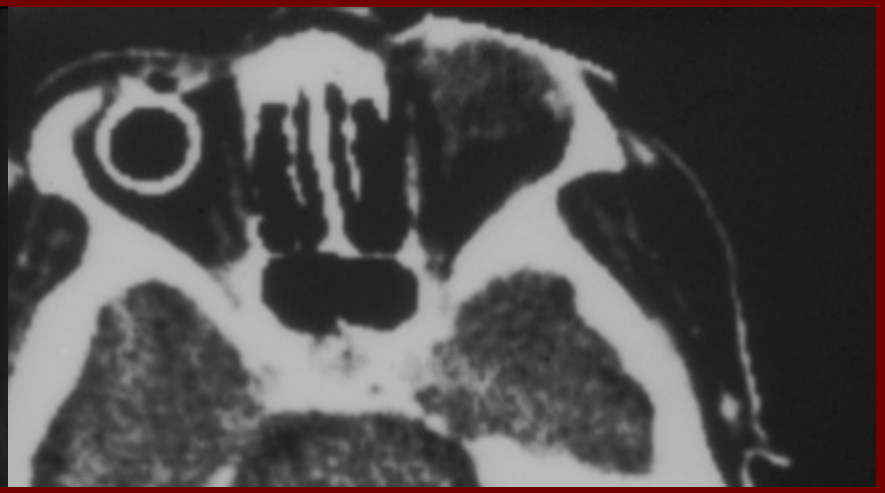
Retinoblastoma



Retinoblastoma

Orbit - Prosthetic eye

Dx: Retinoblastoma



Post Tx w/enucleation

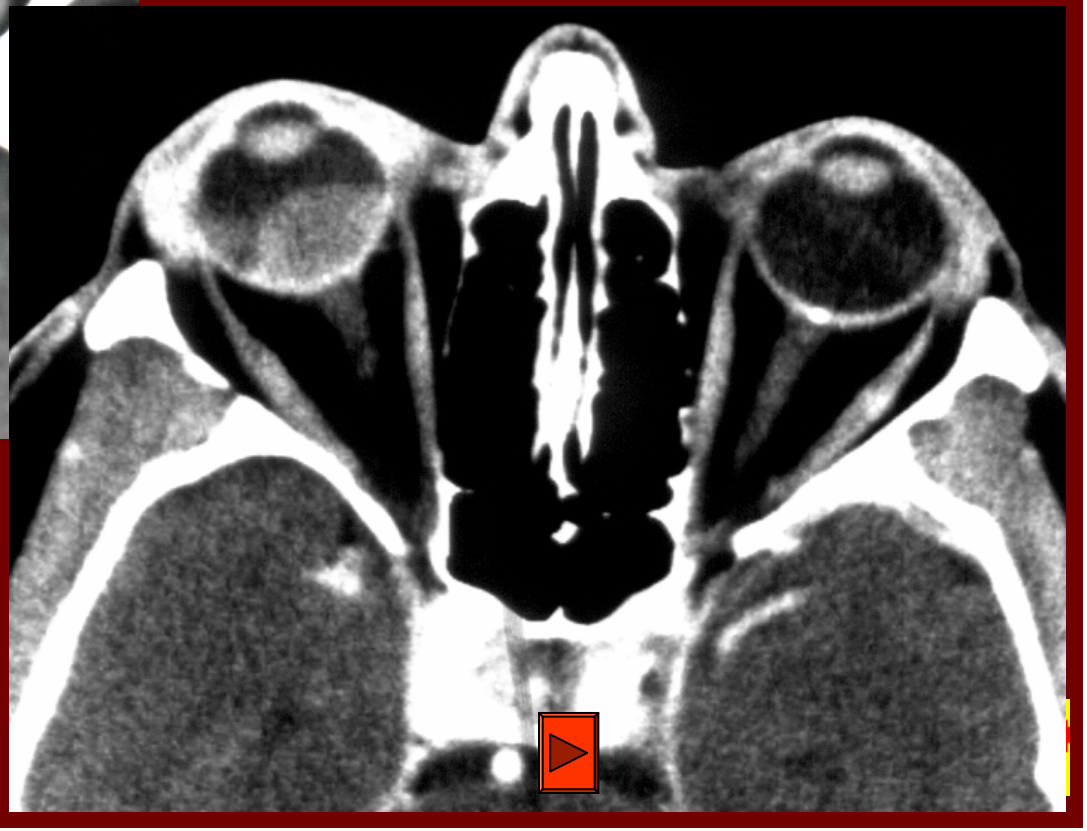
Retinoblastoma

- Who: noninherited in 2/3, Heritable in 1/3
- Heritable:
  - Who: sporadic heritable form in 25%, 12 months avg age
  - Familial retinoblastoma in 8%, aut dominant with 95% penetrance, present 8 months, bilateral in 2/3, may be tri/quadrilateral
- Noninherited:
  - Who: sporadic mutation, 23 months average age
  - Why: sporadic somatic mutation, subsequent generations unaffected

More Retinoblastoma

- Sx: "cat's eye" leukocoria in 60%, decreased visual acutiy, strabismis
- CT: lobular hyperdense mass, orbital calcifications characteristic, enhances
- MR: iso to mildly hyperintense on T1, marked enhancement
- Prognosis: calcifications are favorable, enhancement is not, <10% mortality if optic nerve spared, 65% mortality if choroidal invasion

Ocular Melanoma

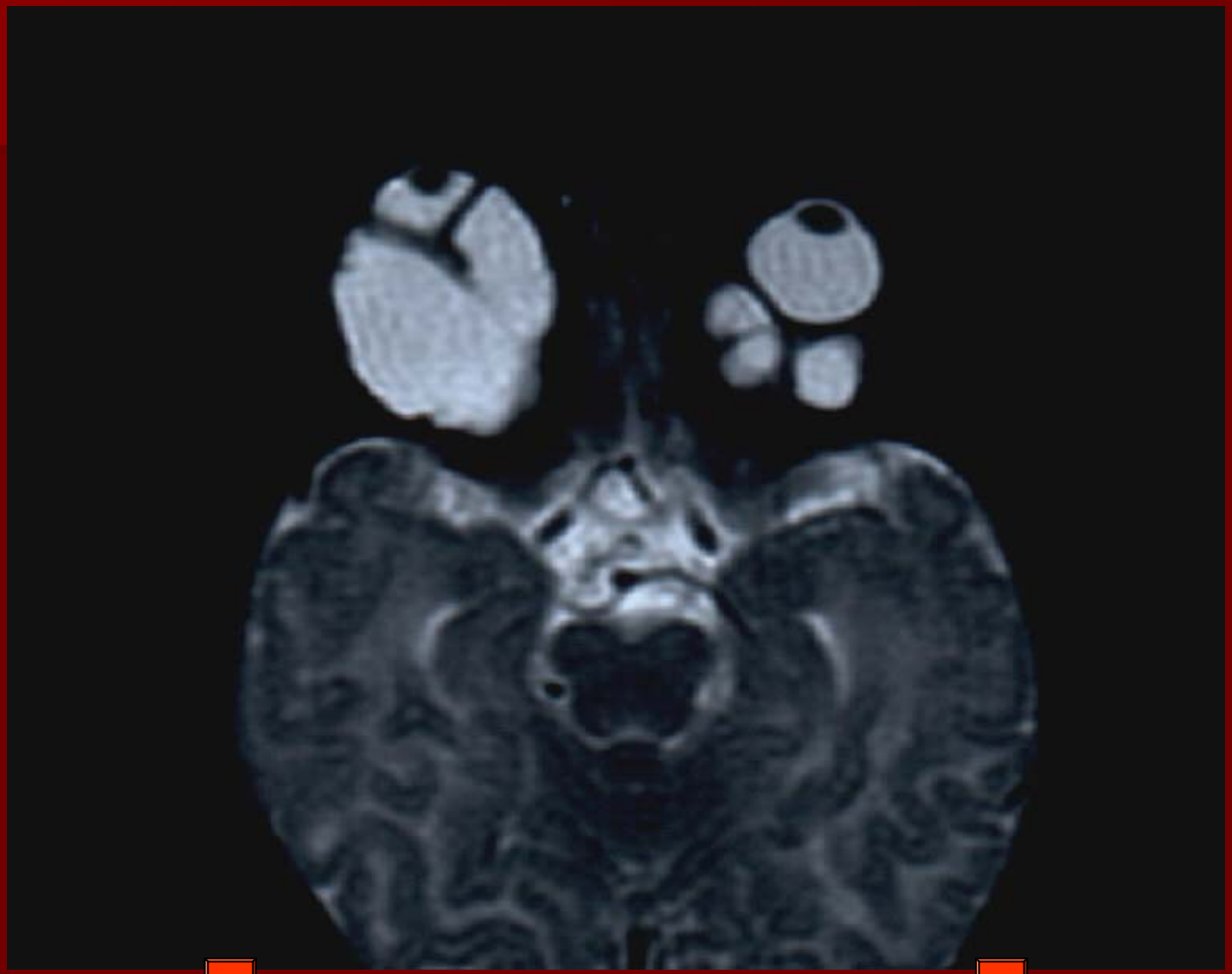


Melanoma

- Who: whites of northern European descent, highest incidence at 55 y.o.
- Why: typically arises from melanocytes in the choroid
- Sx: decreased visual acuity, floaters, painless visual field deficit. Rarely painful.
- CT/MR: Hyperdense, enhancing, T1 bright and T2 dark, good to eval extraocular extension.
- Prognosis: Poor - usually fatal due to mets

Large Globe

Coloboma

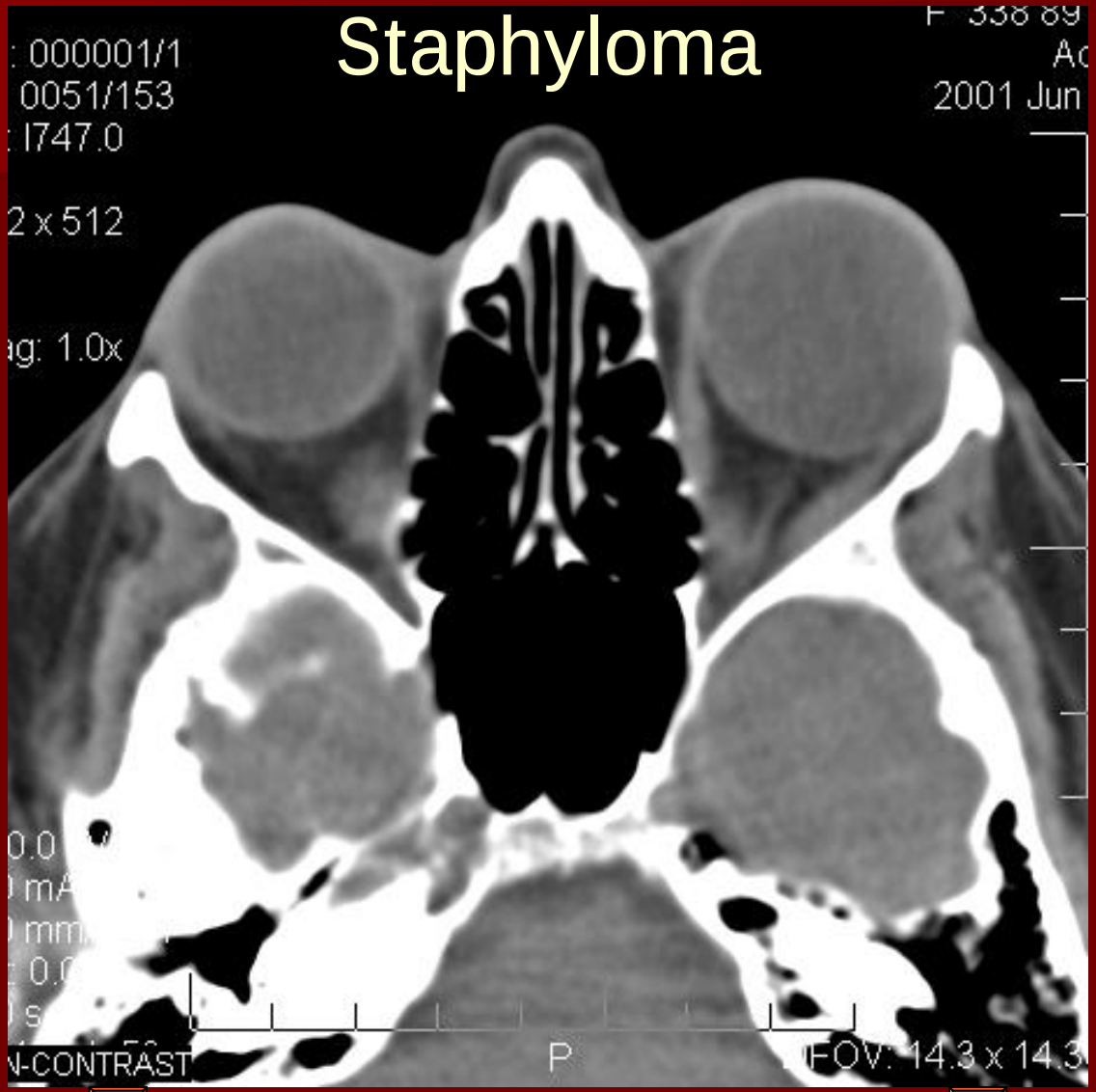


Coloboma

- Who:
  - Anyone, about 60% are bilateral
  - Syndromic associations: CHARGE syndrome
- Why:
  - Hereditary conditions, post-traumatic or post-surgical.
  - Congenital or acquired defect in any ocular structure
  - Results from incomplete closure of choroidal fissure
- Sx's: Blurred vision, decreased visual acuity
- CT/MR:
  - Findings relate to the size of the defect
  - Usually a cone shaped defect at the inferomedial globe
  - Widening of the optic nerve head & continuous with vitreous humor
  - No uveoscleral thinning.

Large Globe

Staphyloma

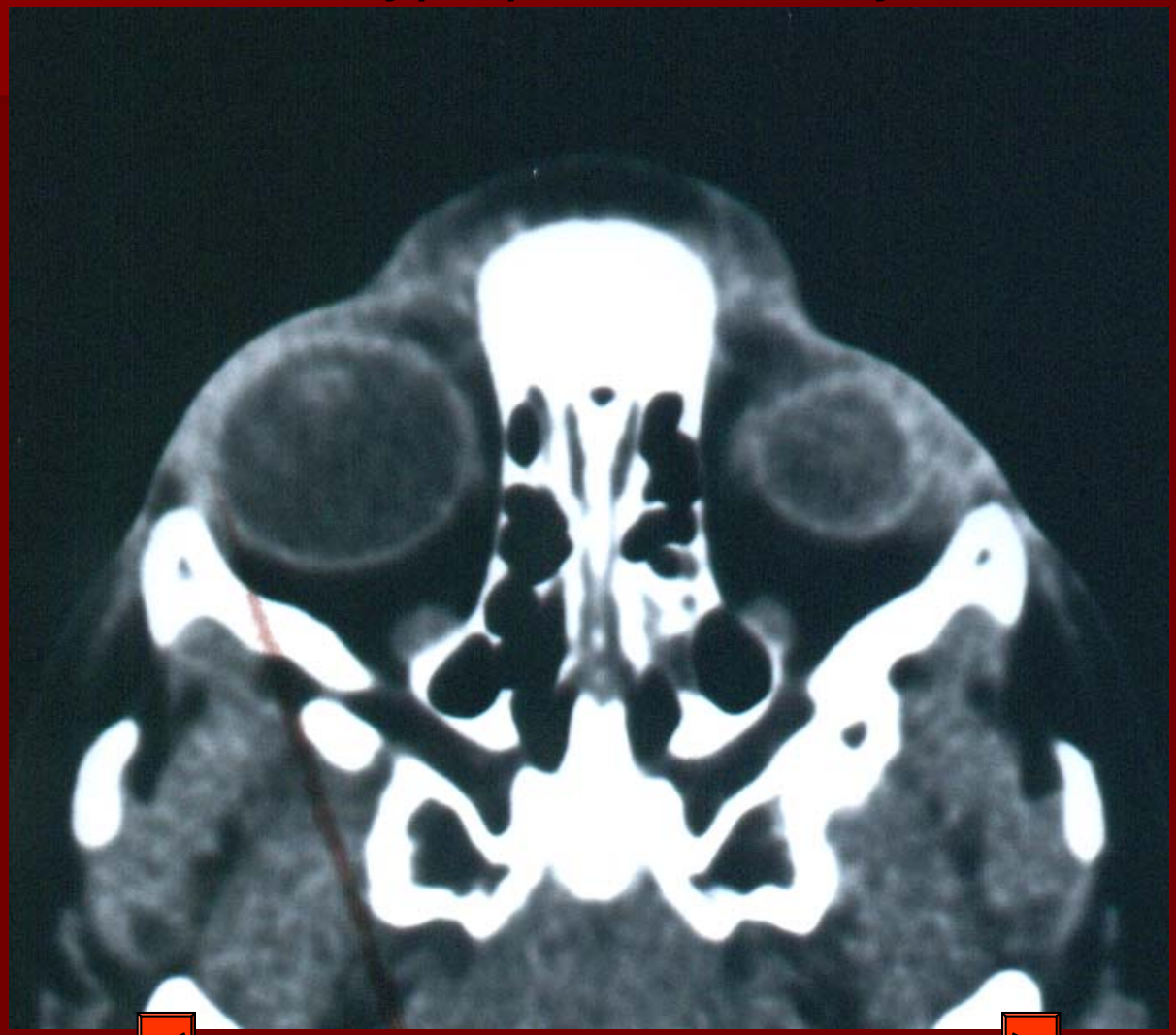


Staphyloma

- Who:
  - Anyone with axial myopia, glaucoma or trauma
  - Patients with RA & other inflammatory conditions.
- Why: Attributed to increase in axial length of the globe.
- Sx's: Blurred distance vision, squinting and eye strain.
- CT/MR:
  - Thinning of the posterior sclera
  - Temporal side of the globe bulges

Small Globe

Persistent Hyperplastic Primary Vitreous

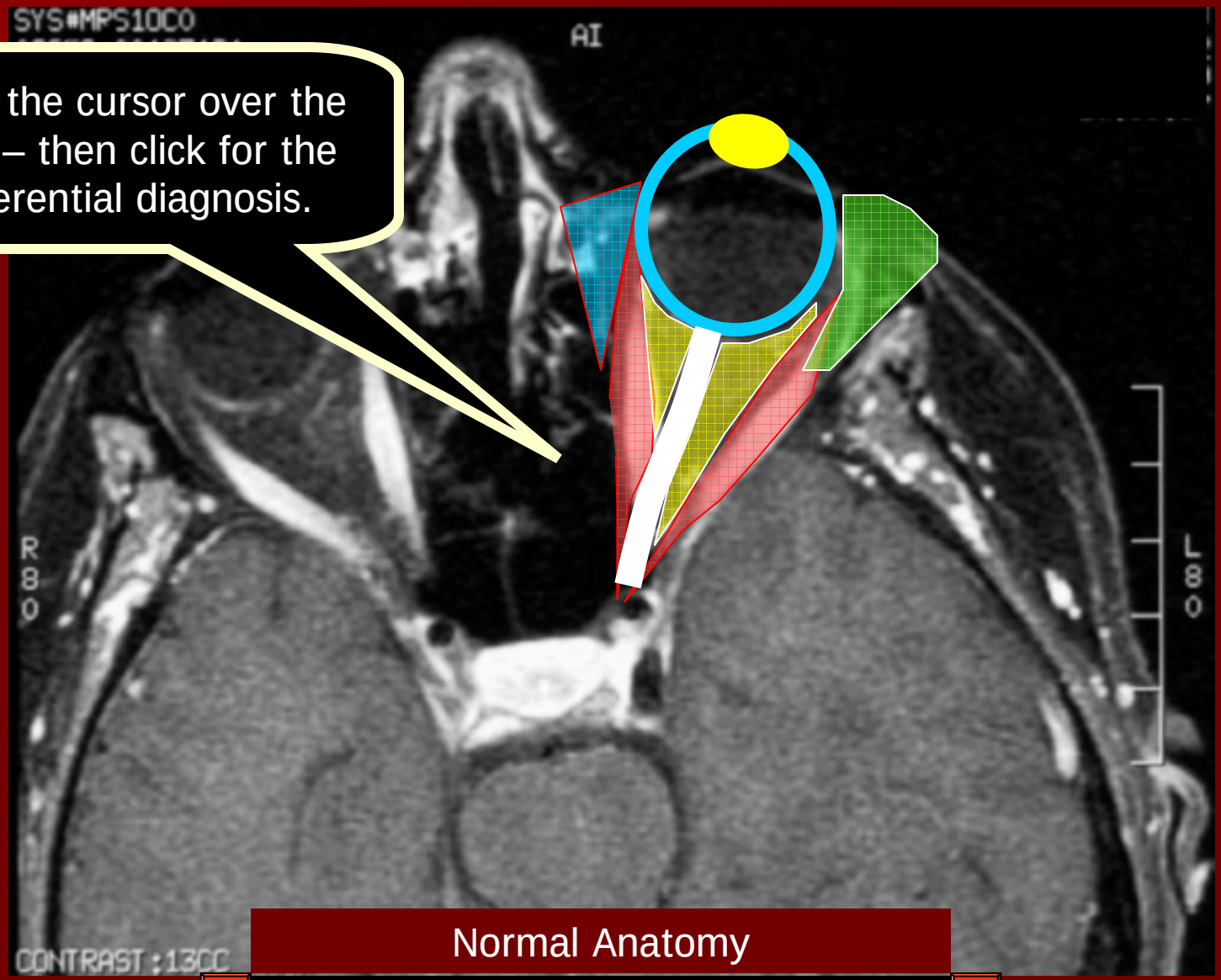


Courtesy: Dave Yousem, MD

Persistent Hyperplastic Primary Vitreous

- Who:
  - Anyone
  - Associated with other ocular malformations (Norrie Disease)
- Why:
  - Persistence of embryonic hyaloid vascular system
  - Hyperplasia/proliferation of embryonic connective tissue
- Sx's: Unilateral Leukokoria
- CT/MRI
  - Microopthalmia, increased attenuation of the vitreous
  - S shaped structure at optic nerve origin, called Cloquet's Canal
    - **Enhancing; hypointense on MR**
  - Does NOT calcify

Orbit Lesion Navigator



Move the cursor over the orbit – then click for the differential diagnosis.

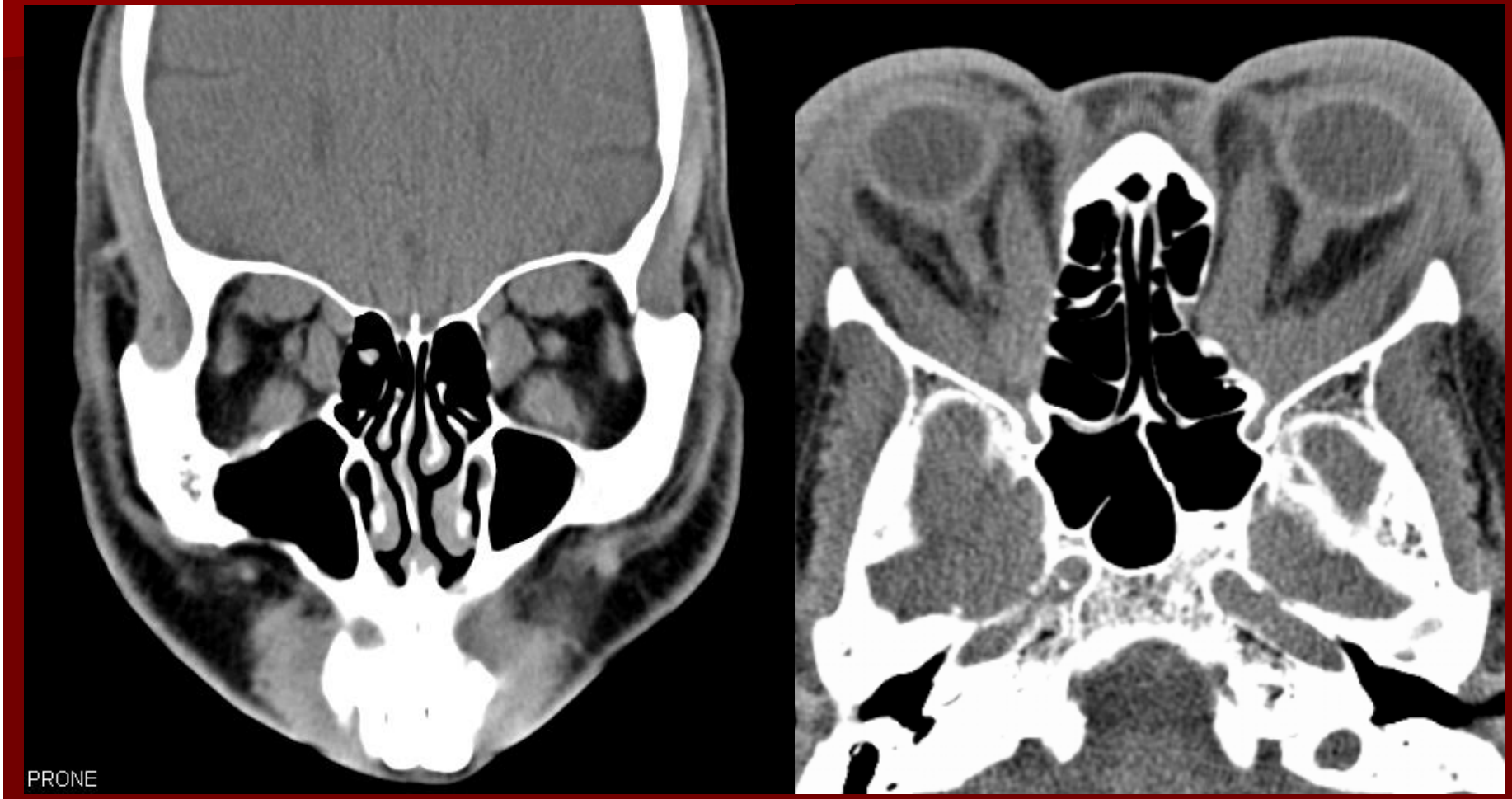
Normal Anatomy

Author Credits

Muscle Cone Lesions

- Thyroid Ophthalmopathy
  - Tendons normal
- Orbital Pseudotumor
  - Tendons affected
- Orbital Cellulitis
- Lymphoma
- Varix
- Metastases

Thyroid Ophthalmopathy

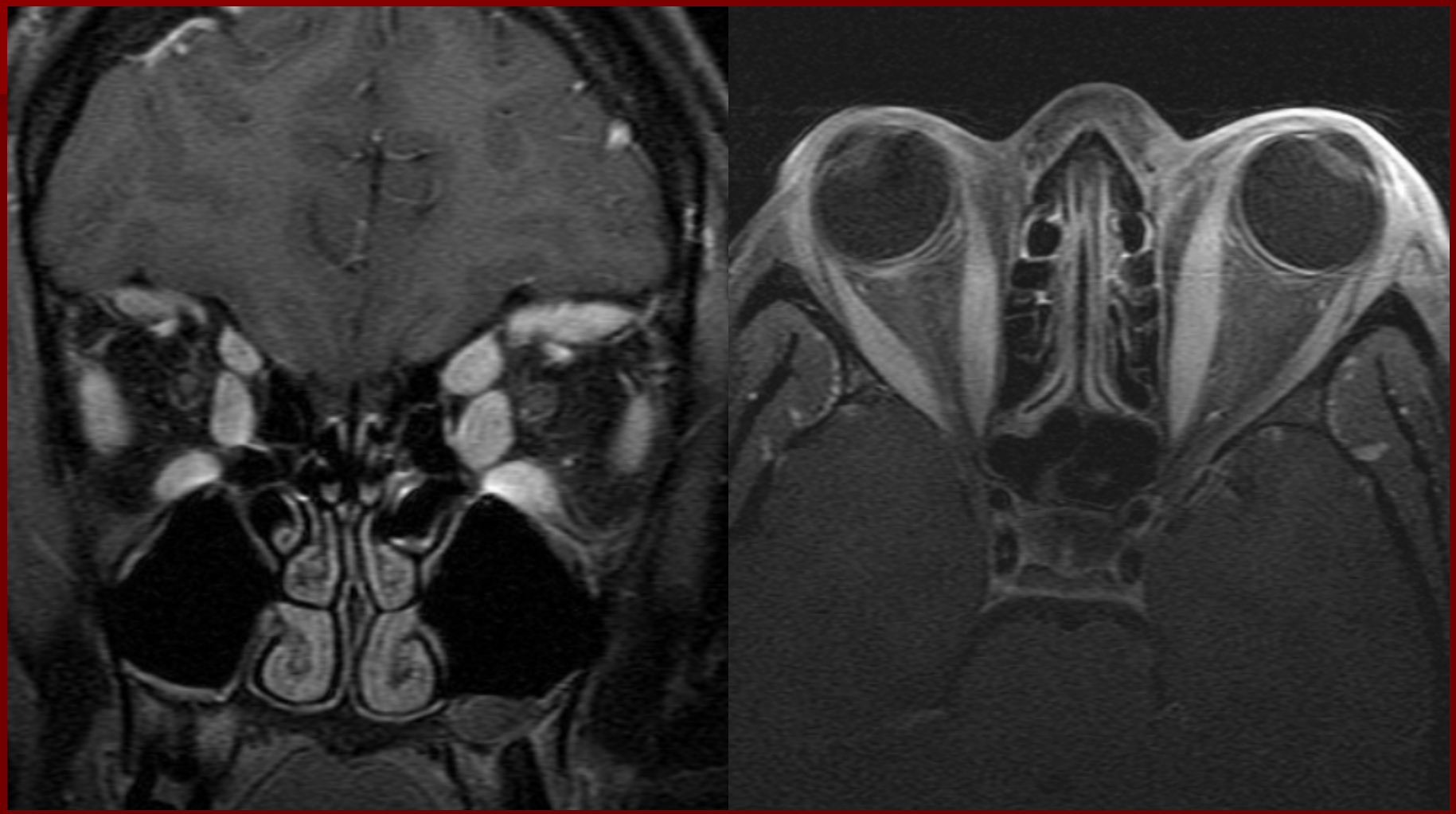


Thyroid Ophthalmopathy

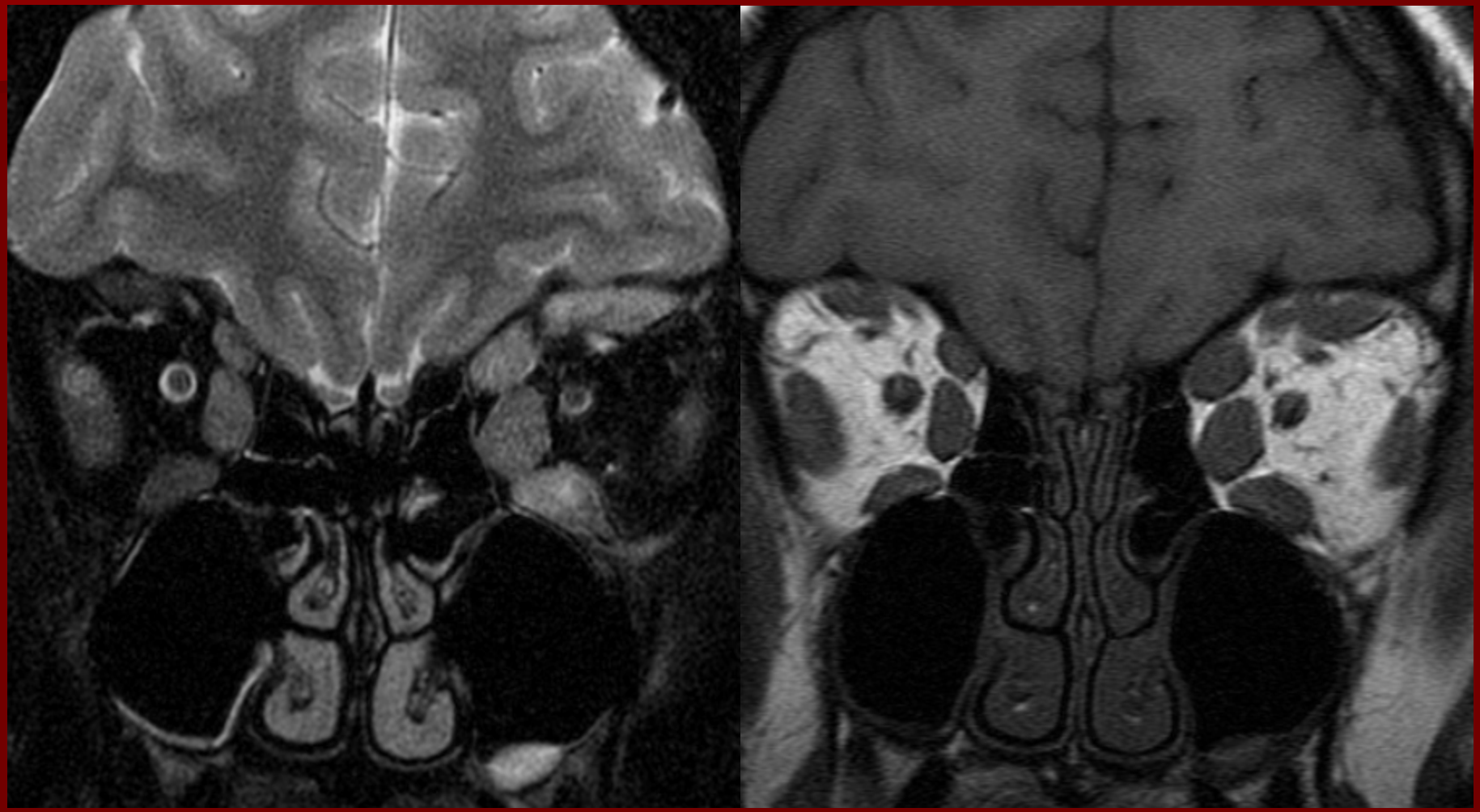
Thyroid Ophthalmopathy

- Who: adults, 1:4 men to women
- Why: Graves dz – increase in orbital pressure leads to muscle ischemia, edema, fibrosis
- Sx: Proptosis – most common cause, uni- or bilateral, lid lag, periorbital swelling
- CT/MR: sparing of ocular muscle insertion on globe, affects I>M>S>L>O, high T2 signal in muscles due to edema
- Prognosis: 90% resolve in 3-36 months, 10% lose visual acuity due to corneal ulcers/optic neuropathy

Pseudotumor of Orbit



Pseudotumor of Orbit



Pseudotumor of Orbit

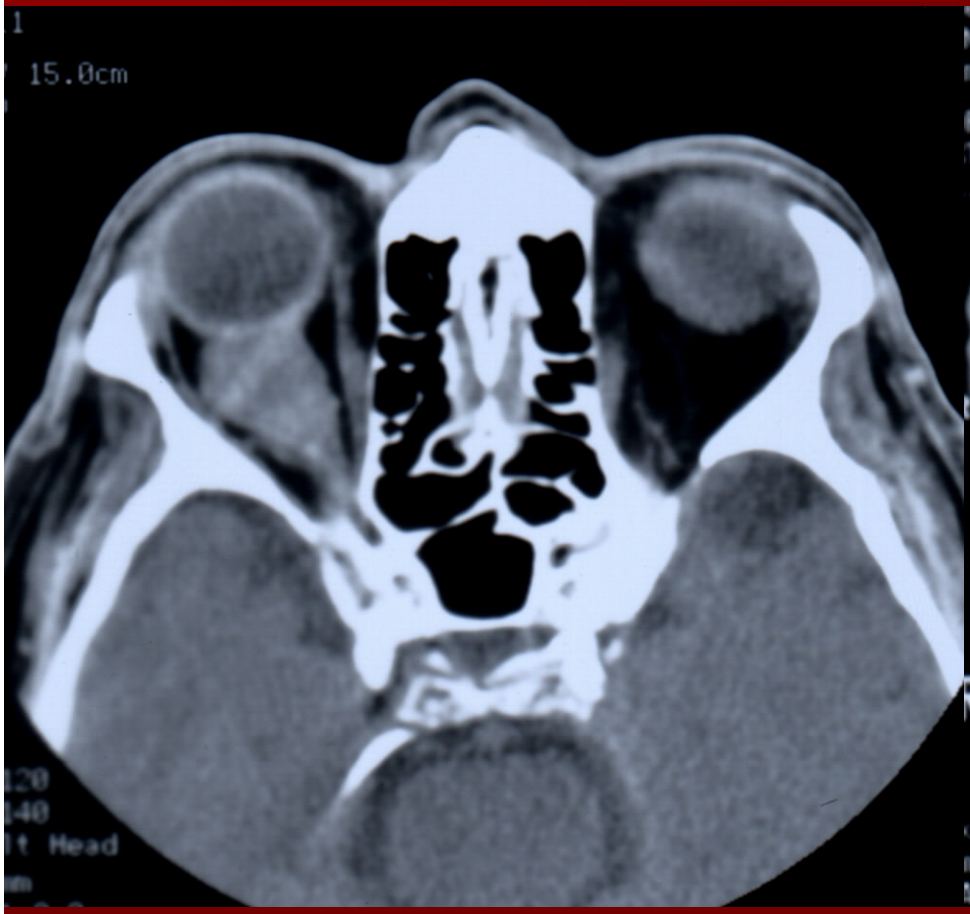
- Who: young women, ¼ unilateral exophthalmos
- Why: idiopathic, sarcoid/collagen d/o, infection, foreign body
- Sx: pain, proptosis, chemosis
- CT: involves retrobulbar fat>extraocular muscle>optic nerve. Increased density of retroorbital fat, diffusely thickened muscles (including tendinous insertions), proptosis
- MR: lesions isointense to fat on T2
- Prognosis: dramatic and rapid response to steroids, may have remitting or chronic and progressive course

Orbital Cellulitis
Post-Septal

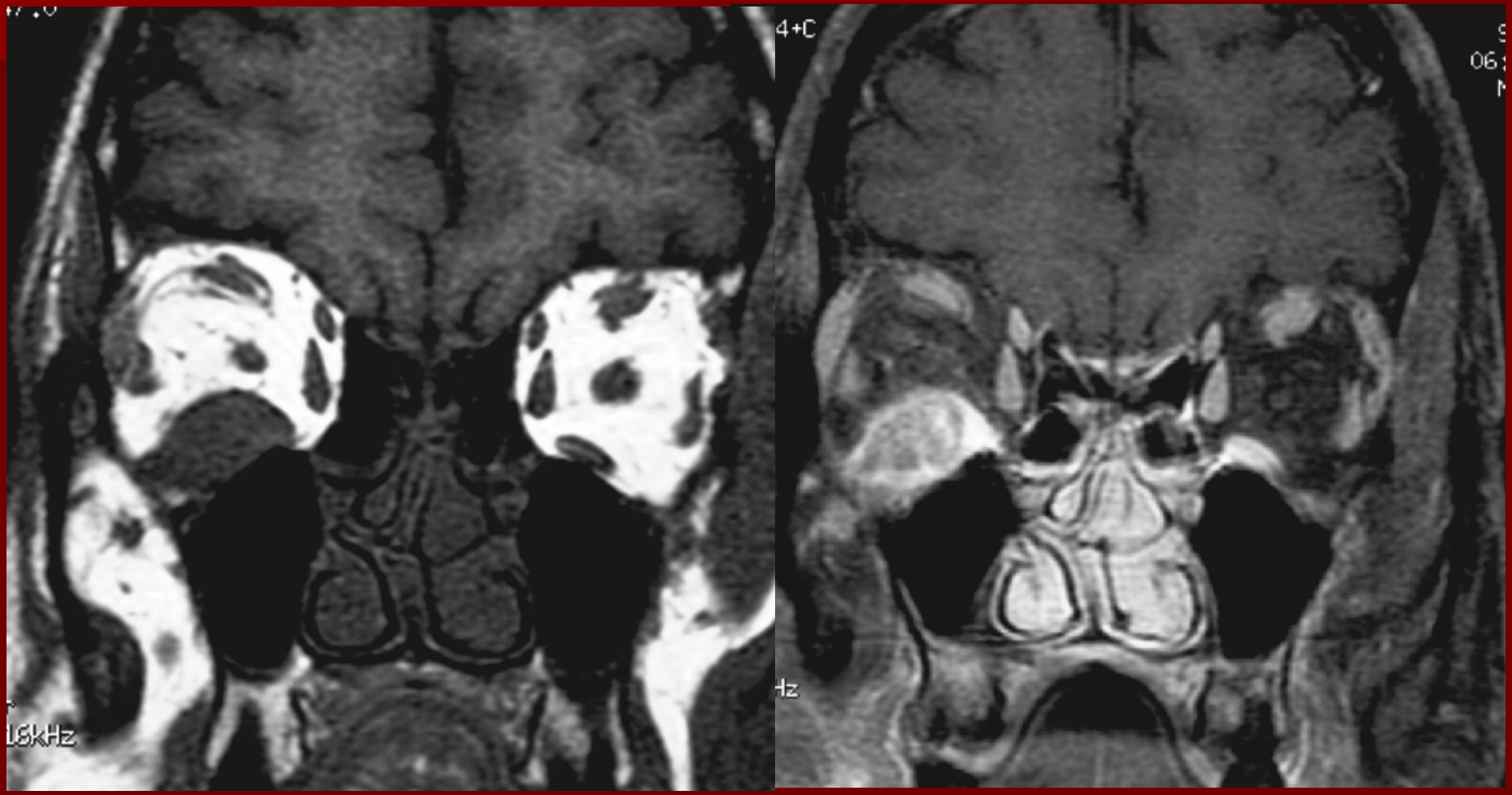
Orbital Cellulitis

- Who: Children >> adults, median 7-12 y.o., twice as common in boys, no racial predilection
- Why: acute bacterial infection, often extending from paranasal sinuses/eyelids
- Sx: proptosis, scleral thickening,
- CT/MR: enlarges and displaces EOM (often medial rectus), increased density of retro-orbital fat, associated ethmoid/max sinusitis. Contrast-enhanced fat-suppressed images most sensitive on MR.
- Prognosis: antibiotics and steroids usually effective, depending on extent of destruction and abscess formation

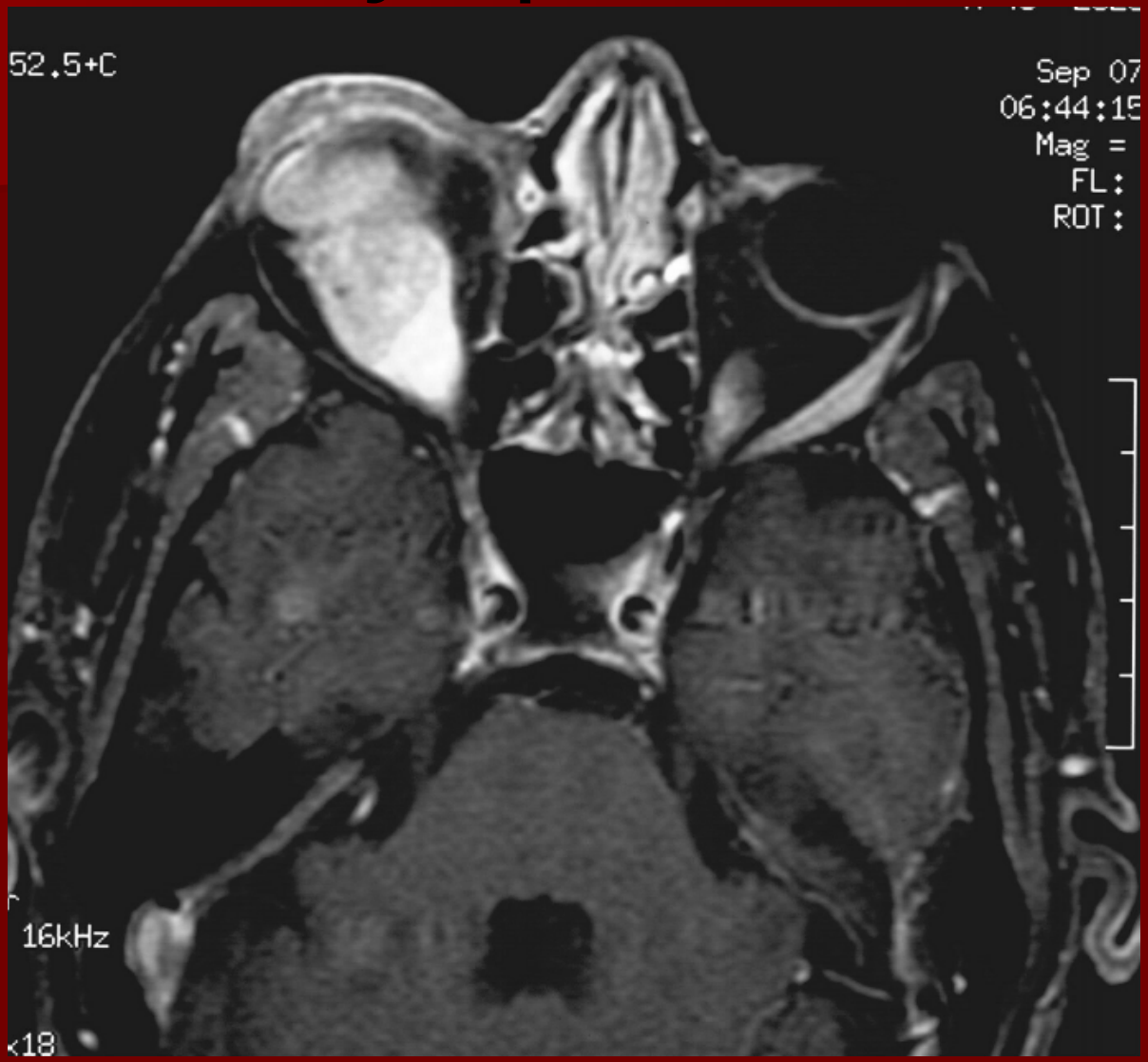
Lymphoma



Lymphoma



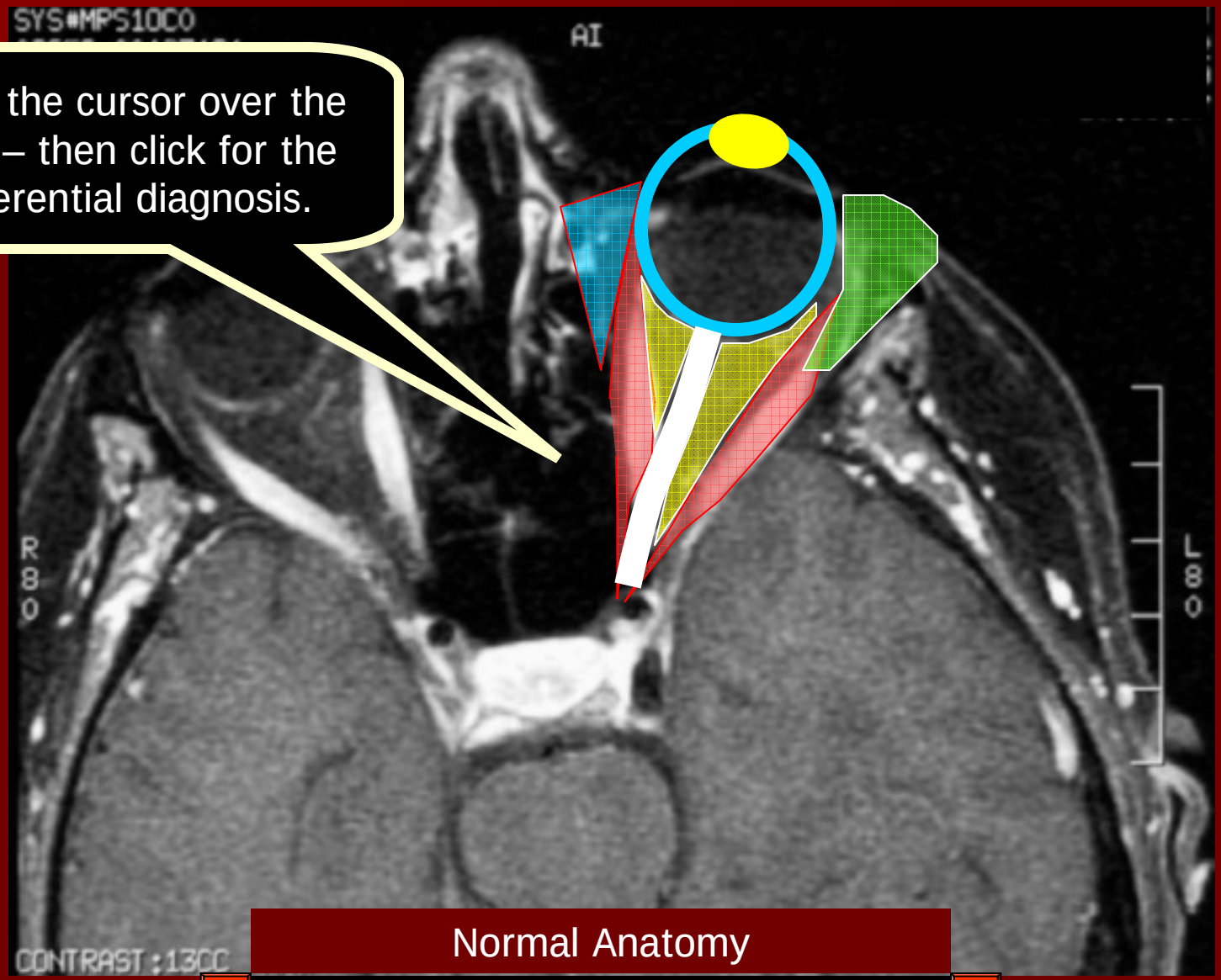
Lymphoma



Lymphoma

- Who: 50 yo to 70 yo
- Why: usually precedes systemic lymphoma
- Sx: painless eyelid swelling, exophthalmos
  - Extraconal (lacrimal gland, anterior extraconal space, retrobulbar) > Intraconal
- CT/MR: large homogenous enhancing mass, slightly T2 hypointense, bone destruction is uncommon
- Prognosis: overall 5-year survival for all NHL is 55%

Orbit Lesion Navigator



Move the cursor over the orbit – then click for the differential diagnosis.

Normal Anatomy

Author Credits

Lacrimal Sac

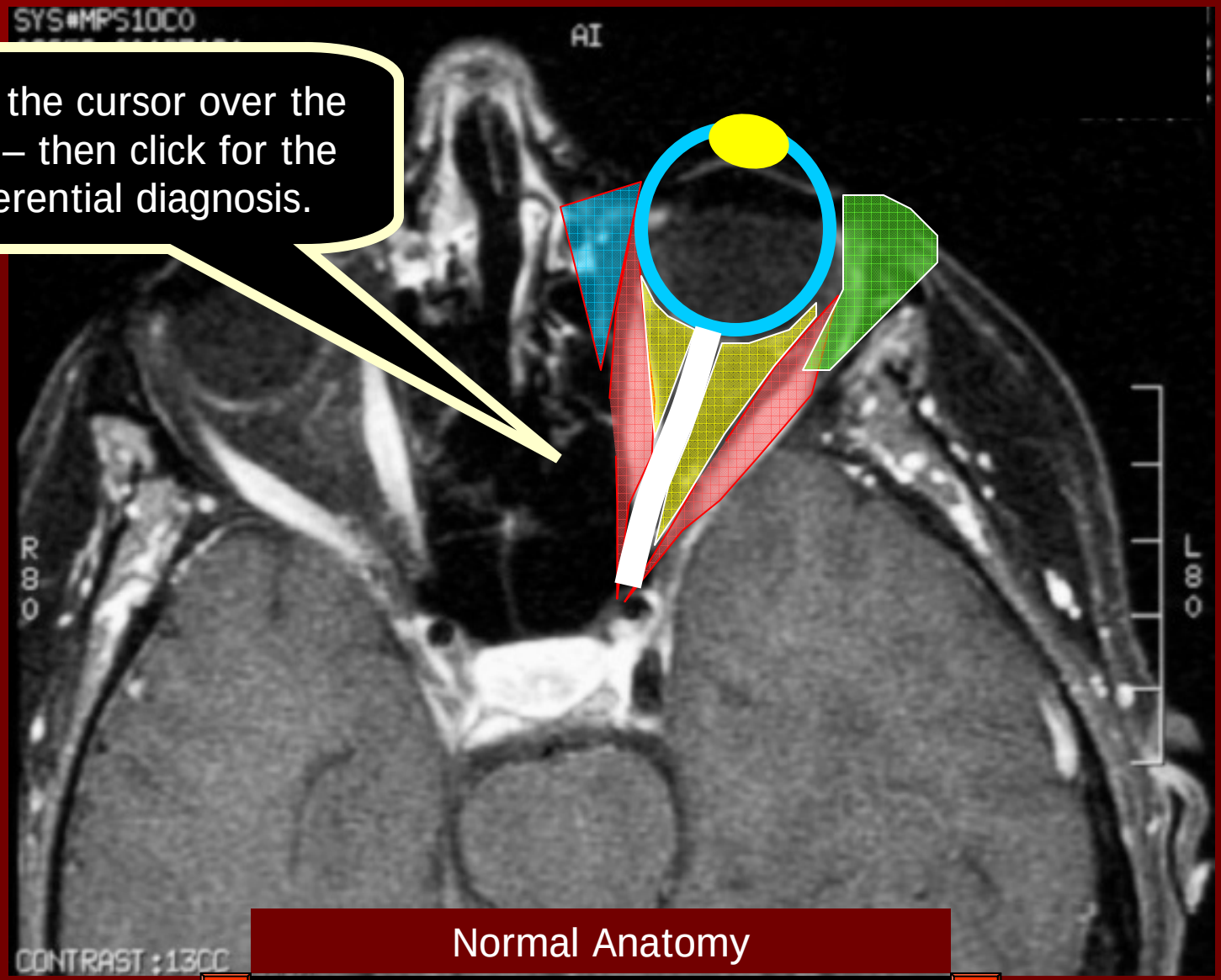
- Dacryocystocele

Dacryocystocele

Dacryocystocele

- Who: neonates
- Why: 2nd most common cause neonatal nasal obstruction (after choanal atresia), imperforate Hasner membrane distally, unknown why proximal duct obstructs
- Sx: tense blue-grey mass at medial canthus
- CT: well-defined homogenous fluid-attenuation mass with thin wall enhancement, may see superior displacement of inf turbinate/contralateral nasal septal shift
- Prognosis: Good if avoid complications of infection/periorbital cellulitis

Orbit Lesion Navigator



Move the cursor over the orbit – then click for the differential diagnosis.

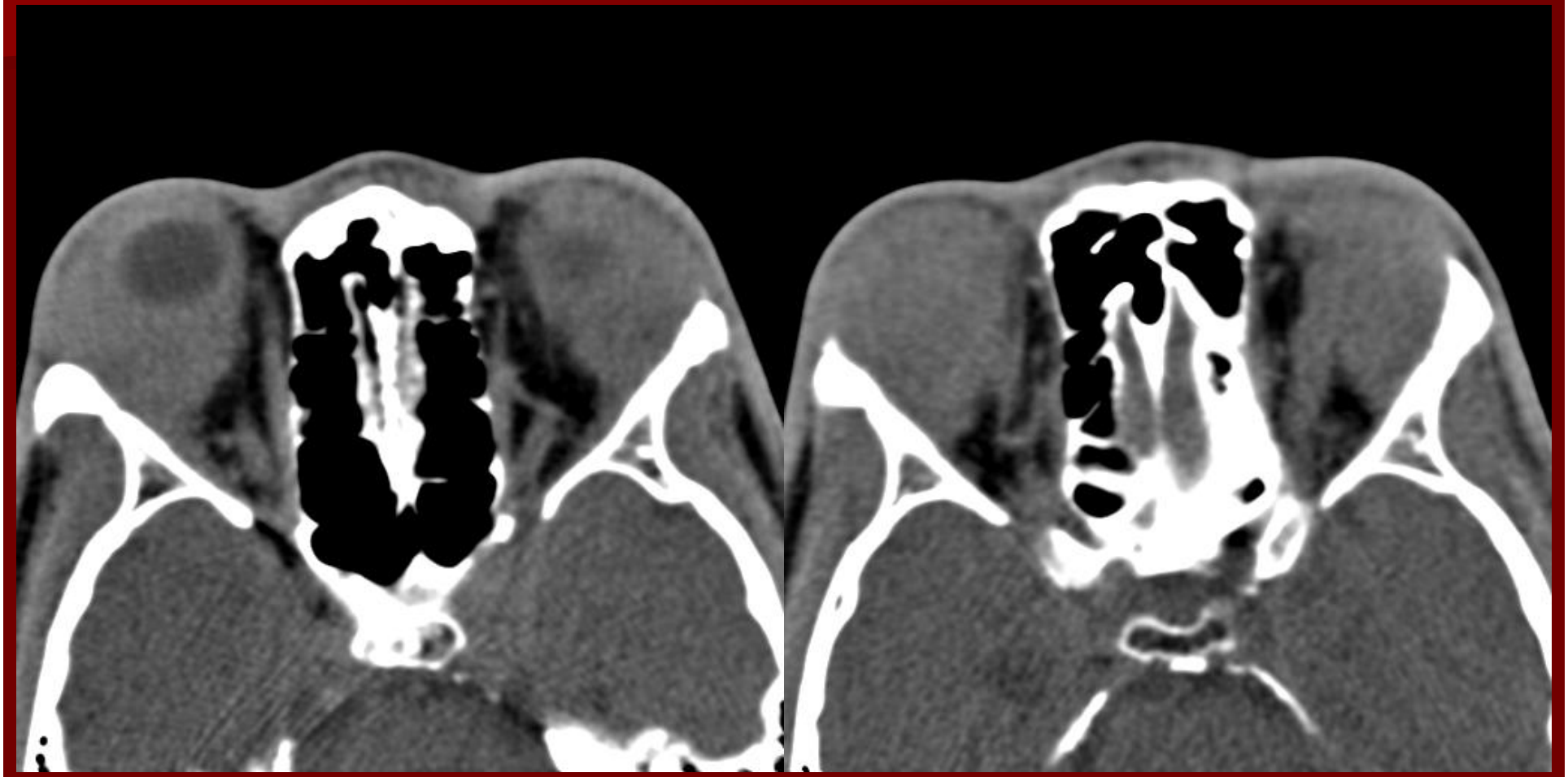
Normal Anatomy

Author Credits

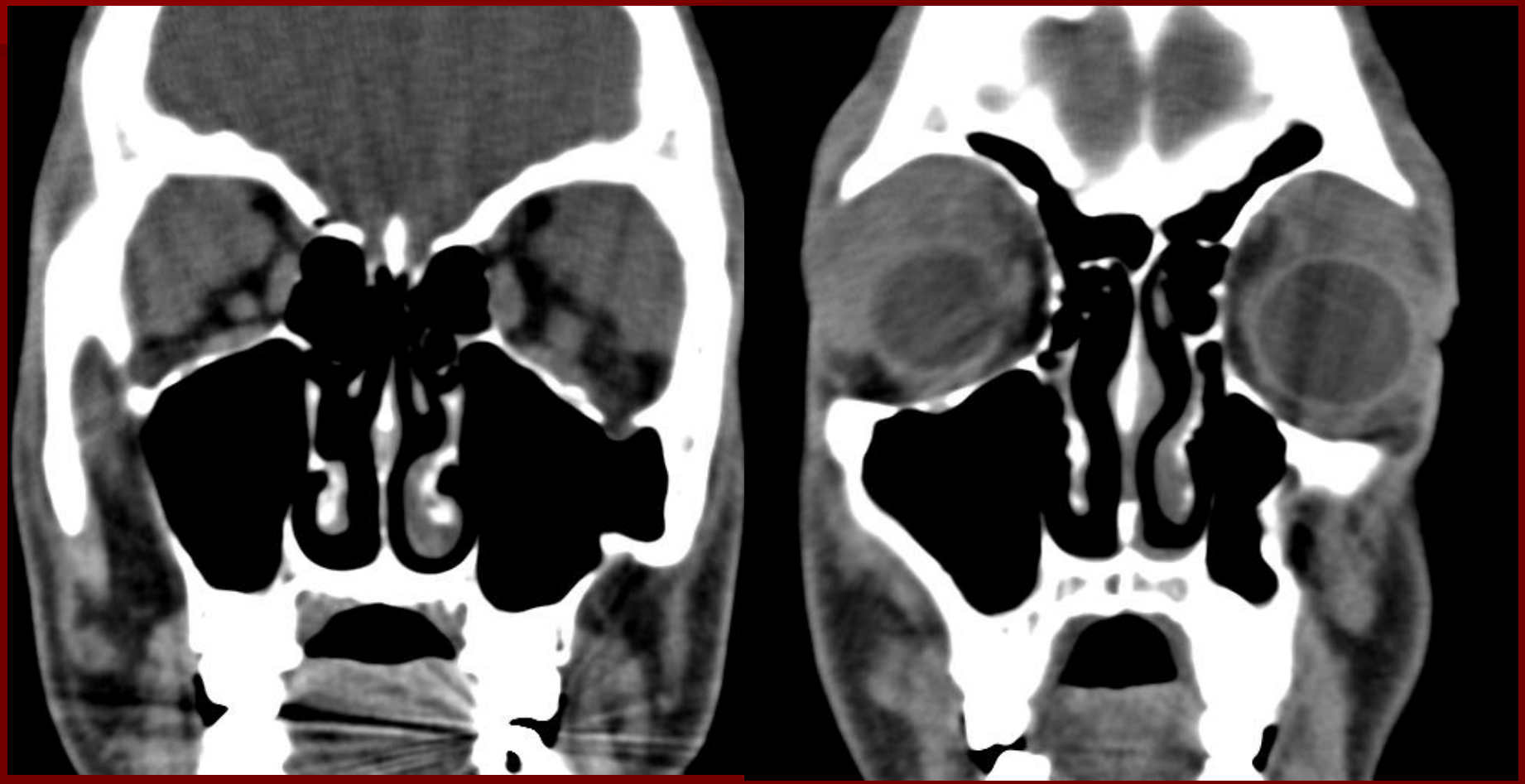
Lacrimal Fossa

- Granulomatous Disease
  - Sarcoid
- Dermoid/Epidermoid Cyst
- Lymphoma
- Primary Neoplasms
  - Mixed tumor

Lacrimal fossa: Sarcoid



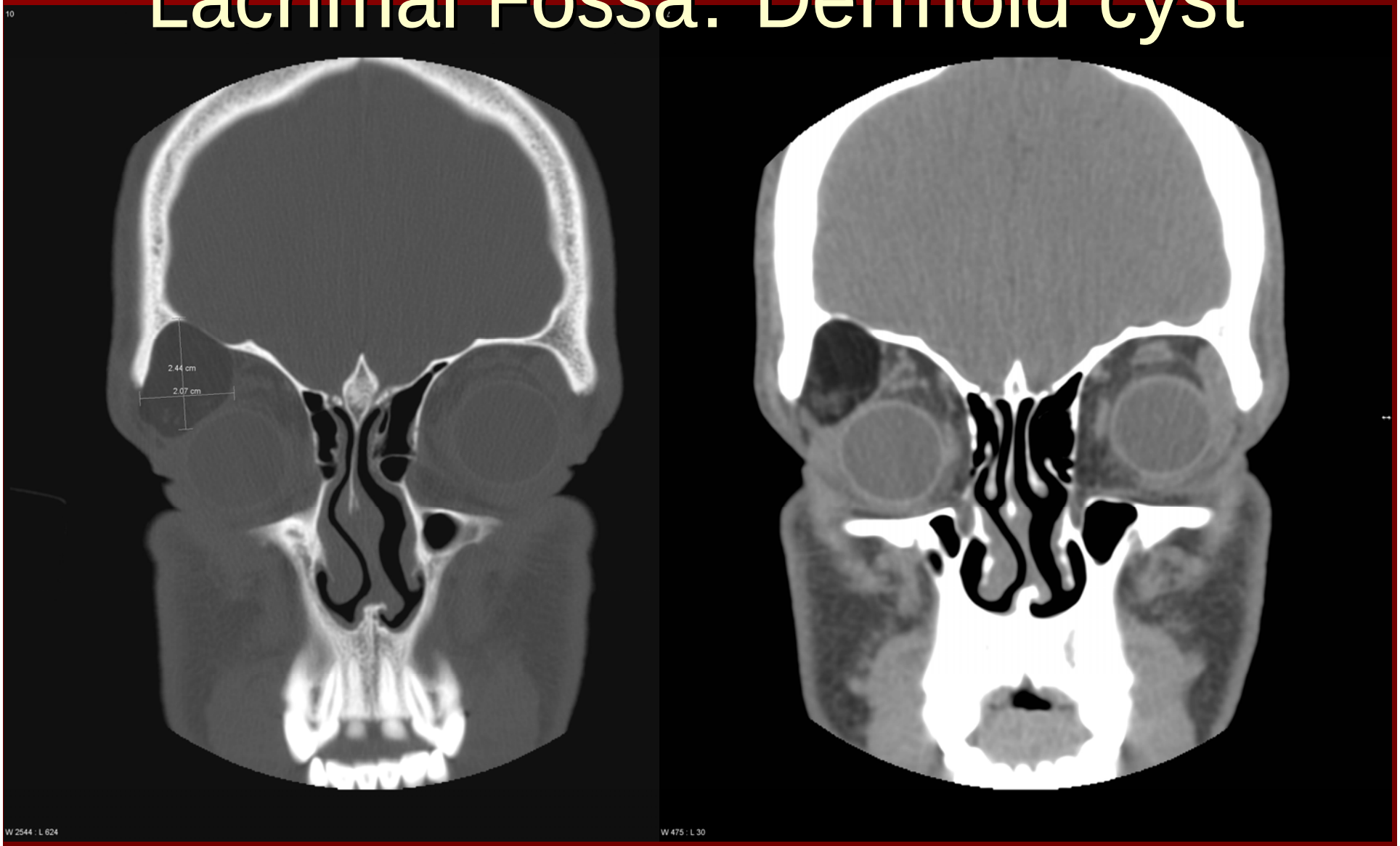
Lacrimal fossa: Sarcoid



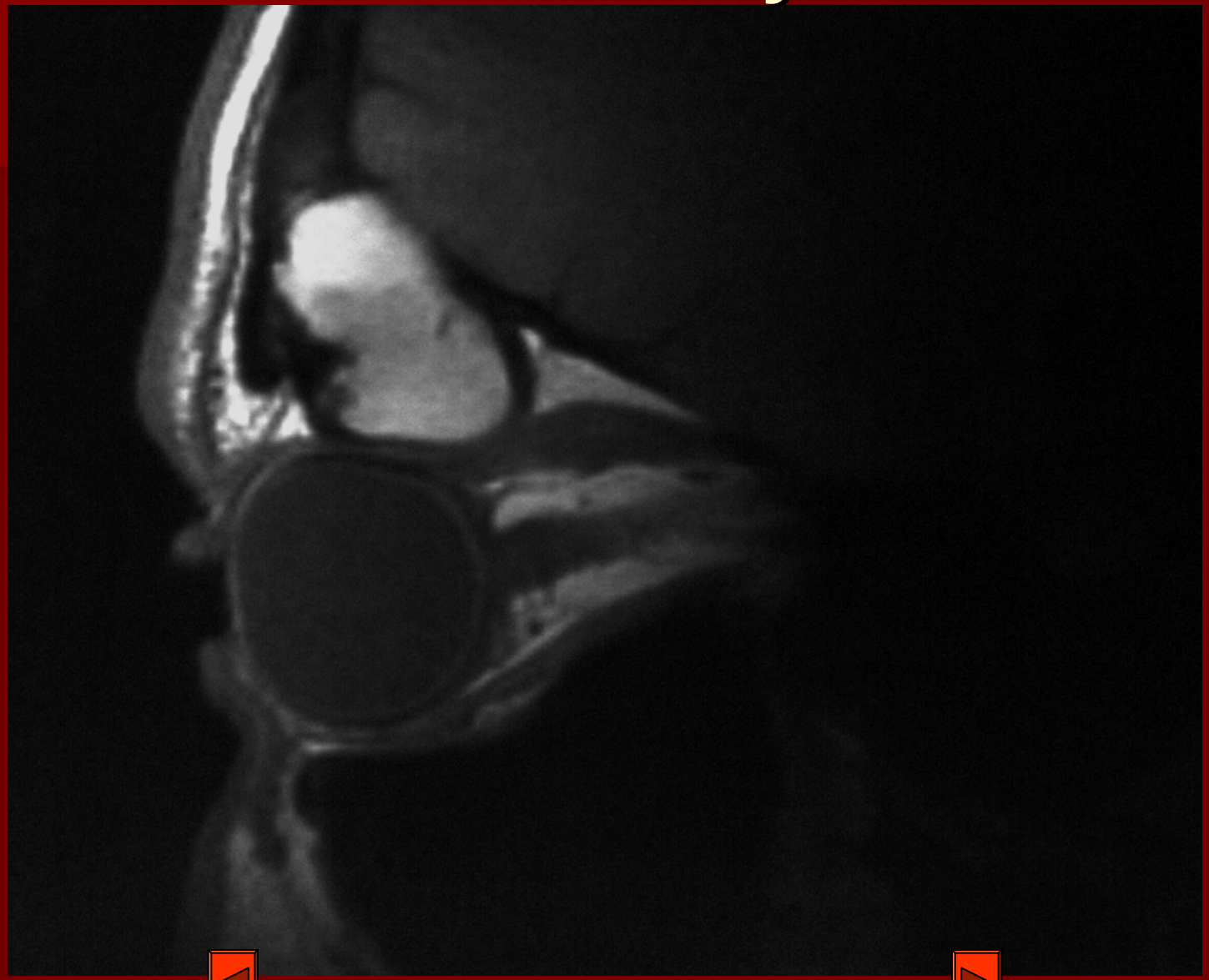
Lacrimal fossa: Sarcoid

- Who: Sarcoid affects African-American women most commonly, bimodal age distribution 25-35 and 45-65 y.o.
- Why: Unknown
- Sx: Nonspecific, can include exophthalmos, pain, visual impairment (anterior uveitis is most common manifestation of sarcoid in orbit)
- CT/MR: Inflammatory process, tendency to extend posteriorly along the optic nerve and involve the chiasm, suprasellar cisterns. Can mimic pseudotumor.
- Prognosis: Variable, improves with steroids but can progress to blindness

Lacrimal Fossa: Dermoid cyst



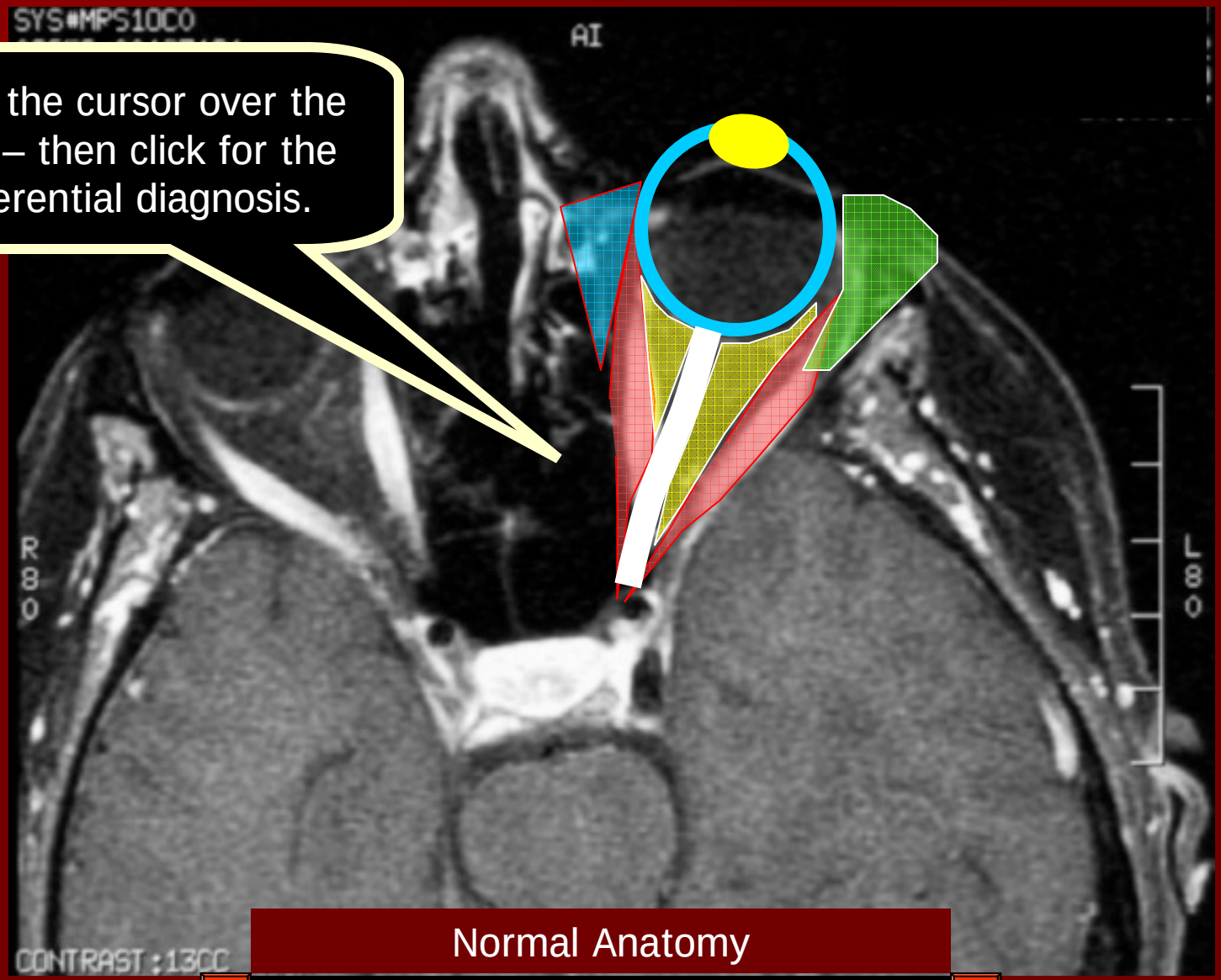
Dermoid cyst



Dermoid cyst

- Who: most common benign orbital tumor of childhood, most common first decade
- Why: usually arieses in fetal cleavage planes/sutures
- Sx: mass effect on EOM/globe
- CT: anterior extracanal orbit, upper temporal>>upper nasal quadrant. Well-defined cystic mass with negative HU, nonenhancing, may have fat-fluid level
- MR: increased signal, T1 and T2
- Prognosis: good, less so if it ruptures and induces granulomatous inflammation

Orbit Lesion Navigator



Move the cursor over the orbit – then click for the differential diagnosis.

Normal Anatomy

Author Credits

Intraconal lesions w/o Optic Nerve Involvement

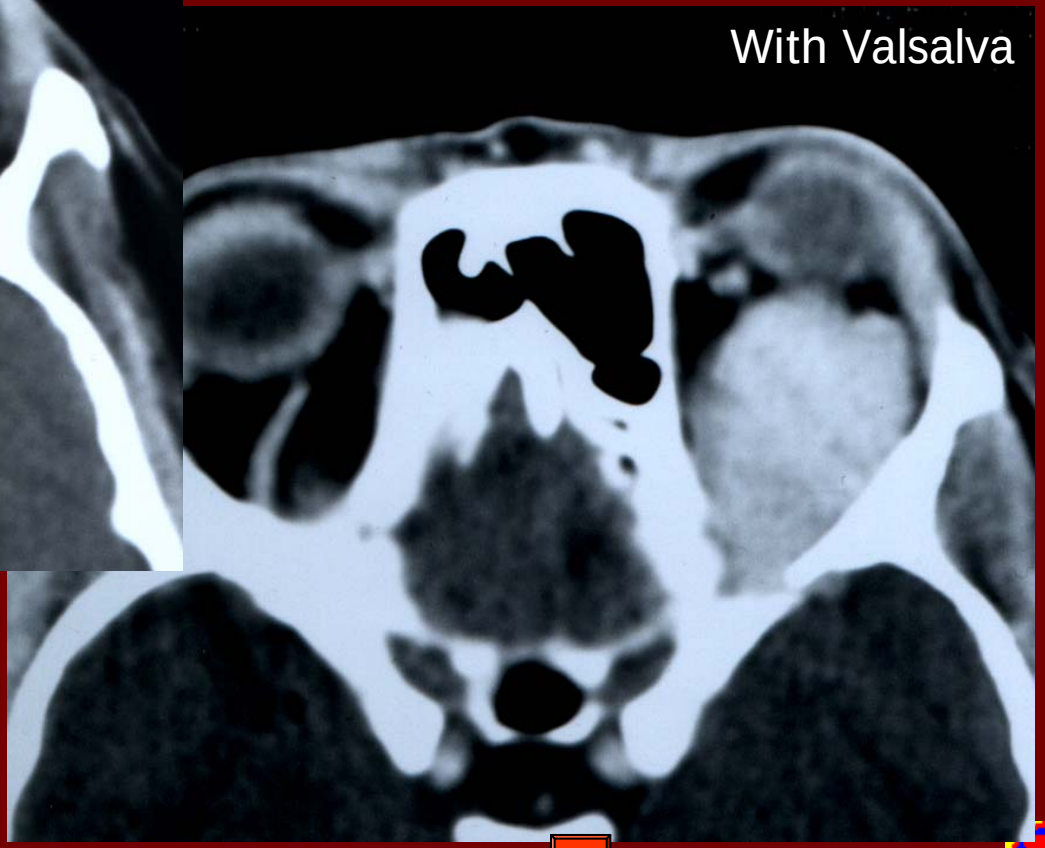
- Cavernous Hemangioma
- Orbital Varix
- Lymphangioma
- Pseudotumor
- Lymphoma
- Metastases
- Cavernous Carotid Fistula
- AVM

Cavernous Hemangioma

Cavernous Hemangioma

- Who: middle-aged adults, F:M is 5:1
- Why: large dilated endothelial lined spaces surrounded by fibrous tissue.
- Sx's: slow progressive proptosis, extraocular muscle and visual impairment
- CT/MR:
  - Sharply demarcated mass in superior-temporal portion of the conus (66%)
  - Expansion of bony orbit
  - Inhomogeneous enhancement
  - NO flow voids on MR
- Prognosis: slowly progressive, may rapidly enlarge during pregnancy.

Orbital Varix



Orbital Varix

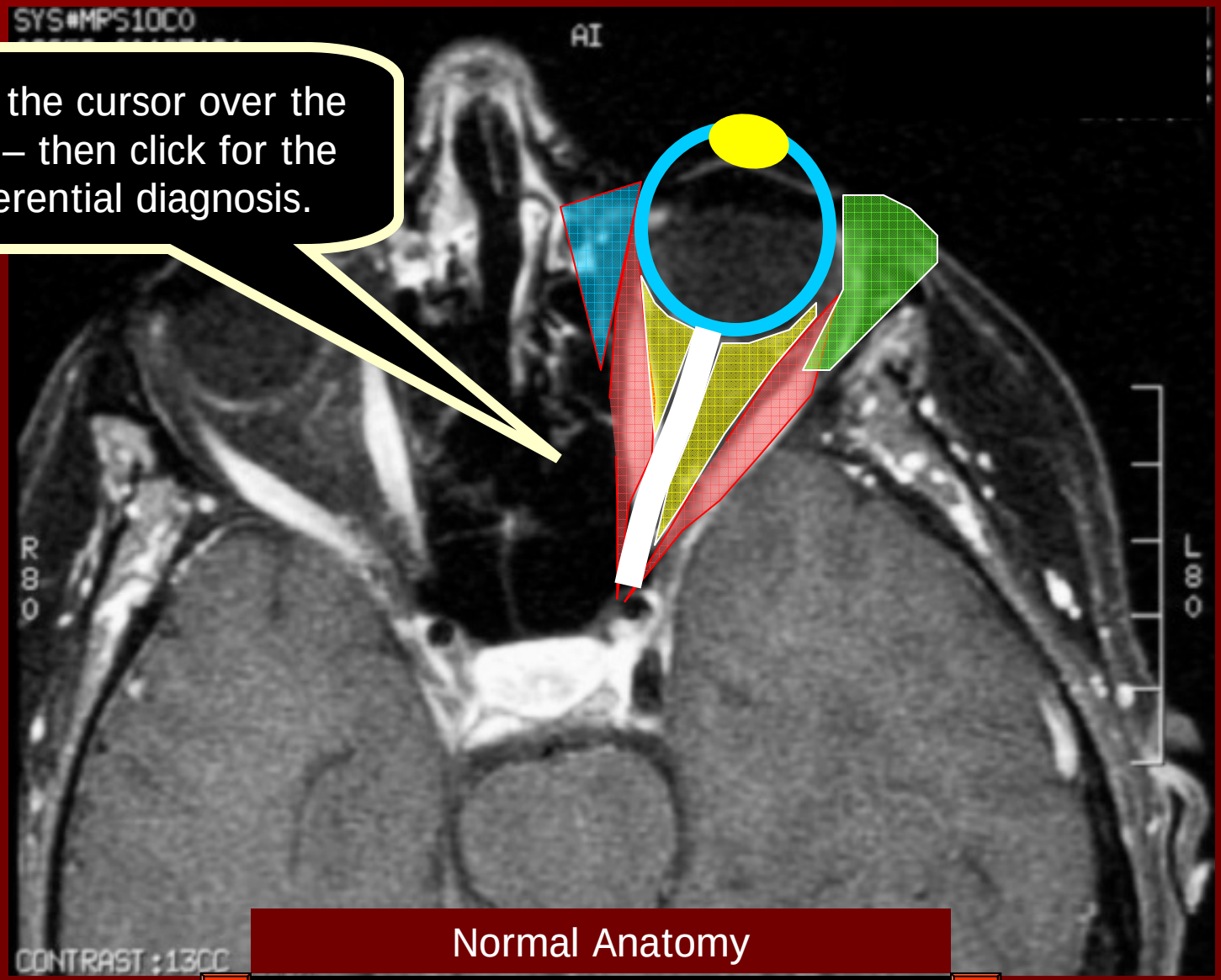
- Who: Anyone
- Why: Intermittent proptosis with straining
- Sx's: Retrobulbar pain
- CT: Enhanced CT with and w/o Valsalva
  - Enhancing, well-defined mass w/o internal septations
  - Enlarges with valsalva
  - May produce bony erosion
  - Involve superior or inferior orbital vein

Lymphangioma

Lymphangioma

- Who: Children
- Why: Bulky, arise from lymphoid follicles
- Sx's:
- CT/MR:
  - Clear fluid channels
  - Enhance less often and less intensely than hemangioma
  - Infiltrative, lack defined capsule
  - Can hemorrhage

Orbit Lesion Navigator



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Normal Anatomy

Author Credits